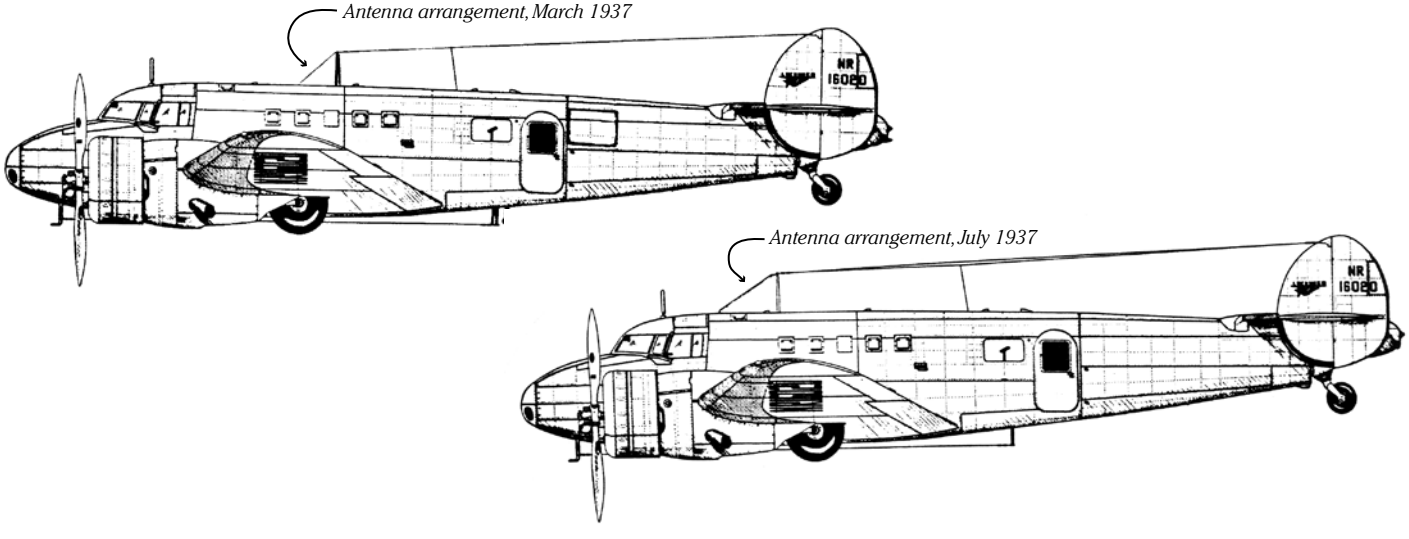
Propagation Analysis

While we're collecting information about what Betty heard we're also investigating how she could have heard it. Bob Brandenburg, TIGHAR #2286, had previously done sophisticated computer modeling of the Electra's radio and antenna system for the 8th Edition of the Earhart Project Book and is now evaluating the radio propagation aspects of this problem using that model, plus information about the radio and antenna on the receiving end provided by Betty and verified by Harry Poole, TIGHAR #2300, in on-site visits to the property where she lived in 1937. Although Bob's analysis is not yet completed, his assessment of the likelihood that signals transmitted from the Earhart aircraft (assuming that it was intact and on the reef at Nikumaroro) could be heard as sporadically intelligible voice messages in St. Petersburg, Florida has, so far, evolved from one chance in a thousand to one chance in five as better information has become available.

How could Betty (and others) have heard understandable messages on a home shortwave set when ships and government stations in the Central Pacific were hearing only faint "carrier wave" (background) signals or, at best, unintelligible voice? We don't yet know for sure, but we have a hunch. Like most aircraft radio transmitters of the time, Amelia's Western Electric 13C put out not only transmissions on the intended frequencies – 3105 Kilocycles, 6210 Kilocycles, and 500 Kilocycles – but it also put out simultaneous, although unintended, signals on "harmonics" of those frequencies – much higher frequencies that are multiples of the primary frequencies. This was a well known phenomenon but it was of no consequence so long as the accidental transmissions on the harmonic frequencies did not interfere with a commercial station or other user.

The other part of the equation seems to be the changes that were made to Earhart's transmitting antenna prior to her second World Flight attempt. Originally, Western Electric had set up the vee antenna that ran from a mast on top of the fuselage to each vertical fin on the tail to be an appropriate length for Earhart's two primary communications frequencies, 3105 and 6210 Kcs. The much lower 500 Kcs frequency required a much longer antenna which was provided by a "trailing wire" that was played out into the slipstream after the aircraft was in flight and reeled back in before landing. The wreck in Hawaii that ended the first World Flight attempt also wiped out the mast on the belly from which the trailing wire was deployed. During repairs back in California the decision was made to eliminate the trailing wire and lengthen the vee antenna on top of the fuselage to accommodate all three frequencies on the one antenna. The mast that supported the point of the vee was moved forward several feet. It was a terrible compromise that provided no meaningful capability to transmit on 500 Kcs while greatly complicating the problem of putting out a decent signal on 3105 and 6210. There appears to have been, however, another consequence to lengthening the vee. The new length made an excellent antenna for the unintended harmonic frequencies. The graphics on the facing page clearly show the differences in lengths.



It may be that this explains why government stations in the Central Pacific, listening for Earhart on the primary frequencies (3105 and 6210) heard very poor signals while, at the same moment, thousands of miles away, amateur radio enthusiasts and ordinary citizens with shortwave receivers were hearing intelligible distress calls when they accidentally stumbled across a harmonic of those frequencies.