Questions Regarding the National Transportation Safety Board Response to the 2013 Petition to Reconsider TWA 800's Probable Cause

On June 19, 2013, an investigative team led by senior NTSB investigator (Ret.) Hank Hughes submitted a petition to the NTSB that analyzed radar data indicating that soon after the jetliner lost electrical power, debris was ejected from the area of the aircraft nearly one-half nautical mile due south of the aircraft's position, at speeds "relative to the accident aircraft [of] between 463 and 495 knots." The petitioners conducted ballistic simulations indicating that the debris' initial velocity was approximately "Mach 4 (four times the speed of sound)" or higher.

In an attempt to explain those findings, the NTSB, within a formal response to that petition, referenced two aircraft components that it said "may have traveled at high velocity" and were accounted for. The NTSB also claimed that the petitioners' velocity calculations "suffer[ed] from a lack of accurate input data".

The following questions relate to these NTSB explanations and claims. The positions and locations described below relate to locations relative to TWA 800, and those positions/locations are estimated based on separation measurements using data from a single radar facility (ISP) with no discernible discontinuities between primary and secondary radar data sets.

1) Regarding the more than 50 data points from multiple radar facilities representing debris within (or drifting out of) an area that the attached report calls the "southern debris cluster":

   A) Please clearly explain what these data points represent, in their totality and in relation to the official crash sequence. When providing your explanation, please note that this cluster of debris first began appearing on Islip's radar approximately 8.5 seconds after TWA 800 lost electrical power at a position nearly ½ mile due south of where the NTSB, based upon analyses of Islip's primary and secondary radar data, determined TWA 800 was in relation to the debris cluster when it lost electrical power. Please also note that additional FAA radar sites confirmed this debris pattern.
   B) Please name any debris components from the aircraft that were within the southern debris cluster approximately 8.5 seconds after TWA 800 lost electrical power. Please also approximate their minimum exit velocity from TWA 800 and explain what accelerated them toward that location.
   NOTE: When answering the above questions, please note that there are no discernible discontinuities between Islip's primary and secondary data and that TWA 800's Islip-radar-based location when it lost electrical power is based on many data points representing its pre- and post-event flight path and is

therefore more accurate than any given ISP primary or secondary data point alone. Please also note that the many data points recorded in or drifting out of the southern debris cluster in their totality make it a near statistical certainty that debris was within that cluster (shown by multiple radar facilities to be significantly south of TWA 800 pre-event flight path) very soon after TWA 800 lost electrical power.

2) Given that the petitioners calculated the debris' average ground velocity to be greater than 150 knots over 8.5 seconds on a nearly due south heading, could the NTSB provide answers to the following questions regarding the "section of the right wing and a portion of the front spar" that "may have traveled at high velocity" and were referenced in the NTSB response to the petitioners' analyses:

   A) What was the likely and simulated average ground velocity/velocities (speeds and headings) of these two aircraft components from the time they separated from TWA 800 to a time 8.5 seconds later?
   B) Did the NTSB conclude that either or both of these sections were most likely and directly accelerated away from the aircraft by the proposed CWT (center wing tank) explosion? If so, please provide the NTSB report or study that presents this conclusion.
   C) Based on available NTSB trajectory simulation data that is consistent with the official crash sequence and that most closely matches the petitioners' calculated debris trajectory to the south, where were each of these aircraft sections 8.5 seconds after they separated from the aircraft and how far is each of these simulated positions from the center of the area ½ mile due south of where TWA 800 lost electrical power? Note that this centered position is approximately 19.6 nm East, 9.2 nm South of Islip's radar antenna.
   D) Are the petitioners correct when they say that no NTSB simulated trajectory of either section of the aircraft cited by the NTSB comes close to matching the radar returns analyzed in their petition? Please explain how this could be when considering the significant number of radar returns from the southern debris cluster.

3) In its petition response, the NTSB said that the petitioners' calculations suffered from a "lack of accurate input data" and suggested that "discontinuities" between Islip secondary and primary radar data may help explain the high velocities calculated.

   A) Why did the NTSB fail to provide an estimate for these alleged discontinuities? Could the NTSB provide such an estimate now? Is the NTSB aware of any data analysis techniques where discontinuities between radar sets from secondary and primary radars from the same site can be estimated? If so,

can the NTSB use such a technique to approximate the discontinuities (if any) between ISP primary and secondary data? If those discontinuities cannot or will not be estimated by such an analysis, please state whether or not a significant discontinuity can be discerned in the respective data sets from the Addendum to the Main Wreckage Flight Path Study referenced in the petition response.

B) The attached draft report determined that no significant discontinuity existed between primary and secondary radar data by analyzing NTSB simulation and debris field data, as well as by conducting a statistical analysis of data from both data sets. The statistical analysis determined that the relative azimuth uncertainty for the mixed data set is consistent with the respective uncertainty from the primary data alone, which indicates that there was no significant discontinuity between ISP secondary and primary data. Could the NTSB verify this analysis by reproducing its results and providing the NTSB's results?

4) The NTSB claimed that the azimuth error for Islip secondary radar was +/- 0.53 degrees, which does not appear to be accurate.

A) Does the +/-0.53 degrees of error apply to data from a sliding window or monopulse beacon system?

B) According to the attached draft report, +/- 0.53 degrees error was indicated in an MIT study as the total error for sliding window position measurements, and +/-0.368 degrees as the total error for monopulse systems. From the 0.368 degrees of error, 0.3 degrees is bias (systematic error), leaving only +/-0.068 degrees of measurement error for monopulse systems. Is this correct?

C) The attached report references a delivery schedule of August of 1994 to Islip's radar site for Mode S beacon system that calculates positions with the monopulse technique. The draft report also confirmed that the secondary data from Islip on the night TWA 800 crashed had a measurement error of approximately +/- 0.06 degrees, which indicates that Islip's secondary measurements were made via the monopulse technique. Can you please confirm this either by reviewing the appropriate documentation or by carrying out a statistical analysis of the secondary data?

D) After considering the above, can you please fully explain your source(s) for the +/-0.53 degrees of azimuth error for ISP secondary data, including relevant quotations from those source(s)? And could you also, in light of the attached report and any other analyses/research, state the likelihood that the ISP secondary data from the crash of TWA 800 had an azimuth uncertainty of +/- 0.53 degrees.

5) The NTSB claimed that ISP primary data had azimuth error of +/-0.35 degrees

and a range error of 1/8 nautical mile.

A) Do these errors include systematic error? If so, please provide the systematic error components of each.
B) Given that the attached report determined that ISP primary data had an azimuth measurement error of 0.11 degrees and a range measurement error of approximately 0.038 nm, and because the report also determined that ISP secondary data was found to fall within the ISP primary uncertainties (i.e. no significant discontinuities between ISP secondary and primary data), is it reasonable to use these measurement errors in the petitioners' velocity calculations? If not, please explain why and provide a more accurate estimate for the errors affecting separation measurements using both ISP primary and secondary data points from the night of the crash.

6) The NTSB suggested that the positions of debris item(s) analyzed by the petitioners could have been incorrect because "radar energy [may have been] reflected from more than one object".

A) Noting that together with the ISP site, data from White Plains and other radar sites indicated that debris did traverse an area that the attached report refers to as the "southern debris cluster," please state the likelihood that reflections could explain all of this data (on the order of 50 data points), most of which conflicts with the official crash scenario. If some or most of these returns represent actual debris, clearly explain in detail the significance of the southern debris cluster and its implications for the official crash sequence.
B) If reflections had affected recorded position(s) of debris in the southern debris cluster, please provide the most likely location (or the most likely range of possible locations) of a debris item that first reflected radar energy in a scenario where multiple reflections resulted in the recording of a location within that cluster. The attached report indicates that this "first reflector" would have most likely had to exist on or near a line between the radar antenna and the recorded position. Is this correct? And if not, please explain what other locations are more likely and why.

7) The NTSB mentioned ½ mile "scatter" among multiple radar facilities and wrote that " any returns that appear to be located less than about ½ nm apart (in two sequential returns) overlap in their areas of uncertainty".

A) Did the petitioners calculate debris velocities using data from multiple radar facilities or data from a single radar facility?
B) Based on the analyses in the attached report and/or any information that can be extracted from the relevant ISP data sets, what is the approximate

uncertainty of a “separation measurement” of any given data point in a mixture of ISP secondary and primary radar data? How does that compare to the ½ mile of scatter among separate radar facilities?