

## **Attachment II**

**TWA Flight 800 Radar Analysis by FBI-Contracted  
Radar Expert Michael O'Rourke**

### LINE-OF-SIGHT

Since the subject of line-of-sight (LOS) came up early on in our discussions, I have provided LOS values for the JFK, HPN, and ISP ASR systems below. The calculations were completed utilizing a program developed at the NTSB, and still in use by that agency. The values listed below depict the NM range of the first primary target received by the site listed after loss of the flight's transponder signal, and represent the minimum MSL altitude that a target would be detected given all things atmospheric were normal at the time of the event. However, as you are aware from the presence of surface (primary) targets extracted from the ISP primary data set at ranges exceeding 40 NM, it appears that these targets were the result of a temperature inversion at the time of the incident.

<u>ASR</u>	<u>RANGE from ASR</u>	<u>MINIMUM ALTITUDE</u>
JFK	50.46nm	1,687'
HPN	53.34nm	1,885'
ISP	21.51nm	306'

Keep in mind that, based on a standard set of circumstances (*weather, atmosphere, radar tuning, etc.*), the ASR antenna should not receive or detect primary targets below the minimum altitudes listed above.

### TARGET SELECTION

For the most part, primary targets were selected in the area of the last received transponder return commencing with the time of the next expected return and continuing for approximately 1¼ minutes (0031:14 - 0032:00), with the exception of JFK data which continues through 0033:12.

The selection of above times is based on my experience with past in-flight break-up accident sequences and the intentional destruction of target drones, while a GCI controller in the military. These experiences have shown that after a time period of approximately 60-75 seconds after an airframe experiences a catastrophic in-flight failure, primary radar targets tend to represent a scenario more closely associated with a chaff<sup>2</sup> drop rather than an intact aircraft, or portion of one.

<sup>2</sup>CHAFF - Thin, narrow metallic strips of various lengths that reflect RF energy. These reflectors, when dropped from an aircraft and allowed to drift downward, with the wind, result in the appearance of targets of varying sizes on radar scopes (displays).

A brief visual review of plotted data indicates the HPN ASR system received the least amount of primary target returns while the JFK system received a larger number of returns. The difference in the number of primary returns received from these sites, at nearly identical ranges, tends to indicate that the temperature inversion played a factor in contributing to the lesser number of targets received by HPN versus the larger number of targets received by JFK.

Of interest in the HPN data is that after 0032:34.671, primary target returns become very intermittent and cease in the accident area at 0033:07. Within the JFK data, only 11 targets are recorded after 0032:30, and become increasingly intermittent in the accident area with primary targets ceasing after 0035:21.

Although primary data associated with the ISP ASR was selected through 0032:31.387 for the purposes of the aforementioned plots, primary target returns within the ISP data are indicated beyond 0040:00. Many of the latter targets appeared near stationary and no determination could be made as to whether these targets were aircraft debris aloft or surface targets (small boats) that reportedly responded to the scene of the crash. Additionally, the possibility exists that a portion of the ISP primary data points could be attributed to heavy dense smoke from a fossil (jet) fuel fire. The foregoing statement may garnish a few snickers, however, I have witnessed several occurrences where such smoke conditions appeared on radar (JFK & EWR ASR systems) as very faint (*TRL 1 values*) from structural fires in and around the New York City area while a controller at JFK. Additionally, I have observed this occurrence in the Minneapolis area while an FAA controller.

### **DISCUSSION**

In an effort to present both sequential target listings and TRL values in a combined view, a series of three joint-plots were created for each of the ASR systems. These plots were designated as TWAJFK7/7A, TWAHPN7/7A, and TWAISP7/7A [ATTACHMENT # 15].

Based on information you provided relative to debris locations documented during the recovery phase [ATTACHMENT # 19], I have marked each of the above plots with circles to indicate the locations of debris from the forward portion of the aircraft in **green** and the aft portion of the aircraft in **blue**. Additionally, I have placed an **orange** circle around a grouping of returns that appear immediately to the right of the apparent flight track of TWA800, approximately 1 N.M. southwest of the area encompassing the nose or forward section.

Since I could not recall seeing a similar depiction of primary target data while visiting CTO nor was there an indication of this debris pattern in the copy of the Oceanering plot indicating TWA800 Tag Locations provided by FAX, I became quite curious as to what portions of the aircraft these could be.

Within the ISP and HPN plots, targets located in the orange circle appear to be closely grouped within an area measuring approximately 0.2 NM east/west and 0.4 NM north/south. Within these plots, both data sets indicate TRL values generally at 3 and below. However, both data sets also include a single TRL value of 7 near the northern end of the target field.

In the JFK plots, targets within the orange circle indicate TRL values of between 5 and 7 while for the most part they appear near the end of the data set. The grouping of the JFK data appears to be generally within a 0.4 NM diameter area.

The relatively tight grouping of these targets in all three data sets (less than 1/2 NM) would tend to indicate more vertical movement versus lateral movement.

Additionally, plotted data indicates targets located within the orange area appear immediately to the right (abaft) of the projected flight path of TWA800 at a distance of approximately 0.5 NM, at 0031:16.224 in the ISP data set. Coincidentally, the first appearance of this target in the HPN data occurred at 0031:14.792 and was also located approximately 0.5 NM to the right of the projected flight path.

A similar target appears to the right of the projected flight track at 0031:16.895 in the JFK data set but at a distance of approximately 0.25 NM.

The above information indicates that some portion or component of the aircraft kicked out to the right nearly immediately after loss of the transponder signal and experienced a throw to the right of the aircraft's flight track of between 0.25 and 0.5 NM. Once it lost the momentum that caused its departure from the aircraft, the part or parts associated with this debris descended to the ocean surface very near vertically with minimal lateral movement.

Target returns located within the green (fwd) and blue (aft) coincide with the information depicting debris fields in the Oceanering TWA800 Tag Location plot.

I doubt that NTSB personnel have plotted all three primary data sets as contained in the enclosed attachments although the recommendation to complete such a process was communicated.

ISP: 1 NM at 01:16.224 ~ 4 sec after explosion  
=> = 1 NM / 4 sec = 450 kts  
HPN: 1 NM at 01:14.792 ~ 2.5 sec after  
=> = 1 NM / 2.5 sec = 720 kts

For your convenience, I have provided three complete sets of text and plots. Also, I have provided six large (30x30") plots depicting numbered sequential returns as well as TRL values from the three ASR systems.

Feel free to call if you have any questions, comments, or suggestions. I should be in for the next few weeks.

Very truly yours,



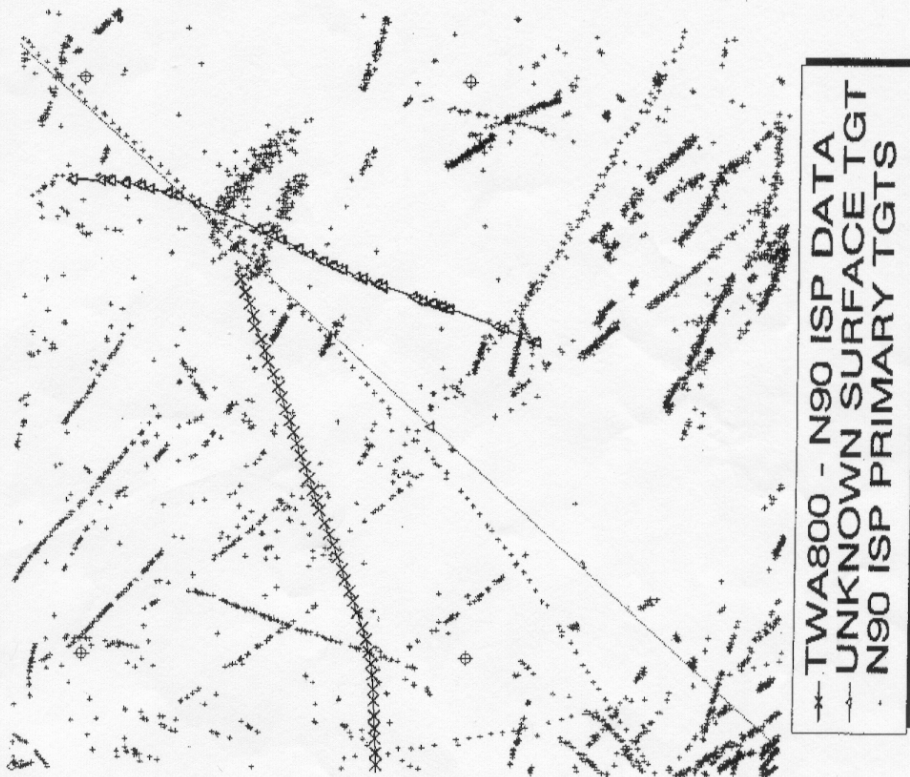
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End.

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TWA800