PAPER RECORDS

	Bates	pgs	Cover letter Description	Ordered Disclosed
Cover letter	1-2	2		
ONE	4-7	4	NTSB Record 6 — 4 pages including graph and chart depicting the lift coefficient of Boeing Model 747 aircraft; graph and chart depicting pitching moment coefficient of Boeing Model 747 aircraft	Yes
TWO THREE	9-17	9	NTSB Record 8 — 3 graphs and 2 charts depicting the lift coefficient, pitching moment coefficient, and the drag coefficient of Boeing Model 747 aircraft NTSB Record 15 - computer program written by NTSB staff to simulate the flight path of aircraft is included on the CD. A memo describing the simulation also is included.	Yes
FOUR	19-33	15	NTSB Record 27 — 15 pages from table tracking the location in the ocean of debris from TWA flight 800. Please note that although the Court allowed the agency to withhold the information contained in the "Comments" column [sic] and the handwritten notes, the agency has chosen to make a discretionary release of this information.	Yes
FIVE	35-43	9	NTSB Record 33 —9 pages of charts of segments of radar data	Yes
SIX	45-73	29	NTSB Record 34 —29 graphic representations of FAA radar data for TWA flight 800	Yes

SEVEN	75-84	10	NTSB Record 35 — 10 graphic representations of NTSB TWA flight 800 Main Wreckage Simulation	Yes
EIGHT	86-147	62	NTSB Record 36 —62 pages of charts of segments of radar data	Yes

ELECTRONIC RECORDS

	Cover letter Description	Disclosed
BALLISTIC	Also enclosed are the software programs entitled, "Ballistic"… The enclosed contains executable files for both Ballistic… no source code, however, exists for the version of Ballistic that the Safety Board used during the TWA 800 investigation.	6/13/08 disk to be read – unknown whether disclosed
BREAKUP	Also enclosed are the software programs entitled… "Breakup." The enclosed disk contains executable files for… Breakups [sic] and input files used for these programs for the flight path study of TWA 800. The disk also contains the source code for Breakup… that the Safety Board used during the TWA 800 investigation.	6/13/08 disk to be read – unknown whether disclosed

"NTSB COMPUTER PROGRAM WRITTEN BY NTSB STAFF TO SIMULATE THE FLIGHT OF THE AIRCRAFT"	NTSB Record 15 - computer program written by NTSB staff to simulate the flight path of aircraft is included on the CD. A memo describing the simulation also is included.	6/13/08 disk to be read – unknown whether disclosed *See* Order Docket # 113 reprinted below

Order
Oct 4, 2006
Docket # 113 at 32-33
Vol V at 1194-1195 Bates 1193-1194 below

Pages 32-33:

Finally, Defendants describe Plaintiff's Record 70[28] as a "[c]omputer program written by NTSB staff to simulate the fight path of aircraft." *Moye Decl*. at p.416. It is undated and found in electronic form only.[28] Defendants withheld this program in full under Exemption 4 because it incorporated engine thrust and draft, lift and pitching moment coefficient data provided by Boeing. *Id.* at p. 419. The program apparently cannot operate without this data; as such, Defendants claim it is not segregable. *Id.* Plaintiff challenges Defendants' withholding of this record.

As they did in the Second CIA Motion, Defendants argue that, under the *National Parks* test, release of this information likely would impair the government's ability to obtain comparable information in the future, and that the disclosure of this information would cause Boeing substantial competitive harm. Defendants rely primarily on the Affidavits and Declarations of Richard S. Breuhaus (Chief Engineer of Air Investigation Safety for Boeing) as well as the Declarations of Melba Moye (Chief of the NTSB's FOIA branch) and its attached *Vaughn* index record descriptions, the Declarations of Terry N. Buroker (the CIA's Information Review Officer, in the Directorate of Intelligence) and the Declarations of Dennis Crider (the NTSB engineer intimately involved in the Flight 800 investigation). The Court discussed several of these materials, such as the Breuhaus Declarations and the First Buroker Declaration, in its previous order, along with the September 8, 2005 Hoffstadt Affidavit, on which Plaintiff relies. *See* F.Supp. 2d , 2006 WL 2789870 at *17-19. The declarations and affidavits the Court previously considered Contain information that overlaps the additional declarations and affidavits described

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[28] Plaintiffs Record 70 is also identified as NTSB Record 15. This record also contains contested redactions under Exemption 5 which are addressed in the next section of this Order.

[28] In response to the Court's order for *in camera* submission of the NTSB records, Defendants submitted "five pages of the main-body simulation executable," which they state are "representative of Record 15." This printout appears to consist of data matrices in binary code and would undoubtedly be incomprehensible to anyone lacking computer, technical or scientific expertise.

just above. In fact, some of the testimony is repeated word-for-word from one declaration to another. For the reasons set forth in the previous Summary Judgment Order <u>Id</u>., the Court finds that there is a factual dispute as to whether Boeing will suffer substantial competitive harm and Defendants have not proffered evidence sufficient to meet their burden to show that release of this information likely would impair the government's ability to obtain comparable necessary information in the future. Therefore, the Court DENIES summary judgment concerning the contested uses of Exemption 4 in each of these ten records.

<u>Order</u>
Oct 4, 2006
Docket # 113 at 39-43
Vol V at 1200-1204

Pages 39-43:

vi. Plaintiff's Record 70

Plaintiff's Record 70, (NTSB Record 15) also discussed above, is a computer program written to simulate the flight path of Flight 800, and available only in

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electronic form. Moye Decl., at p. 416. This program was withheld in full based upon the deliberative process privilege.

Dennis Crider, an NTSB employee, developed a flight simulation software program prior to joining the NTSB. *Cridèr Decl.*, at ¶ 9; *Moye Decl.*, at 416, While at the NTSB, Crider further developed and used the simulation program in several accident investigations, including that of Flight 800. *Crider Decl.*, at ¶ 9; *Moye Decl.*, at p. 416.

There is no standardization for simulation code, and the program was never intended for public use, so it was written in a format intuitive to Crider.[32] *Crider Decl.*, at ¶ 8. At the time of the Flight 800 investigation, there were no instructions or guides for using the program except for limited comments written by Crider. *Id.* (Defendants do not explain the comments.) The program itself uses mathematical models[33] that describe the forces acting on the specific aircraft type at issue to derive the motion resulting from these forces. *Id.* The mathematical formulations necessary for the simulation program are written in computer code, and according to Crider are not segregable. *Id.*

One of Crider's assignments during the investigation of Flight 800 was to determine the flight path of the aircraft after it lost its forward fuselage. *Moye Decl.*, at p. 416. Crider modified his program for this task. *Crider Decl.*, at ¶ 19; *Moye Decl.*, at p. 416. NTSB management reviewed and commented on his work after the initial simulation was complete. *Crider Decl.*, at ¶ 19. Crider explained that, over time, he continued to exercise his own judgment in determining whether the program was operating as designed and whether it was representing and using data

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[32] This program is written in C++, with portions written in C. *Crider Decl.*, at ¶ 9

[33] Some of these mathematical models contain information the government claims is proprietary to Boeing. *Moye Decl.*, at p. 417.

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appropriately. He modified the program and the simulation as necessary, such as when new data became available. *Id*. at ¶ 20-21, 23-24.

To run a specific simulation, the program needs such information as the starting condition (airspeed, position, altitude, etc.), specific configuration the flight (such as flap setting and landing gear position), the aircraft's weight and center of gravity, and some basis for guiding the aircraft. *Crider Decl*., at ¶¶ 11-12; *Moye Decl*., at p. 418. The program may be adjusted and adapted to analyze differing versions of aerodynamic data and physical attributes of aircraft.[34] *Id*. at p. 421. The flight data recorder and radar data provided much of this information for Flight 800. *Id*. at p. 4l8.

Defendants claim this program was used to provide information the NTSB used in determining the probable cause of the crash of Flight 800 and the safety recommendations that followed. They claim that an understanding of the flight path following the separation of the plane's nose was expected to aid the NTSB in understanding the causes of the crash. *Id*. at pp. 421-22. Defendants argue that Crider used the program to pursue different possibilities related to the flight path of Flight 800. *Id*. at p. 422. Crider considers his simulation to be a tool to do so. *Supp. Crider Decl*., at ¶ 5. The source code of the simulation used by Crider is no longer available, as it has been updated and improved over time. *Id*. at ¶ 5. Therefore, the only "simulation software" maintained as a record is the executable file, which consists of binary machine language (Os and 1s).[35] *Id*.

Crider explains that, over time, he would run simulations using his program and the data inputs would be changed between each run to attempt to make the

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[34]   Even so, though, the record at issue is simply a fixed iteration consisting of the program at a certain time, *not* a series of programs that might reveal how they changed as Crider refined them.

[35]   Crider did retain the last control system source file and aerodynamics source file specific to Flight 800. *Supp. Crider Decl*. at ¶ 6. However, these do not appear to be a part of Plaintiff Record 70, but rather two separate responsive records.

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simulation results "best represent the action of the aircraft as reflected by the radar data." *Id*. at ¶¶ 8-9. Crider claims this is a "deliberative, analytical process in which staff must be free to adjust and experiment without fear that staff work at whatever stage will be released and compared to the Safety Board's ultimate conclusions…." *Id*. at 10.

Plaintiff does not challenge that this record is predecisional, and the Court finds that it is. However, the Court does not agree with Defendants that Content of the simulation program, as opposed to that of the input or output files, is deliberative.

First, although Crider clearly utilized some judgment in selecting "relevant" data he needed for his simulation program, *see Crider Decl*., at ¶¶ 18, 23-24, the selection of some data from a larger set does not, alone, amount to a deliberative process under Exemption 5. *See First Summary Judgment Order*, ___F. Supp. 2d___, 2006 WL 2789870 at * 14, 23. Instead, the government must show that the deliberative process can be determined from the selection of the data alone. *Carter v. United States Dep't of Commerce*, 307 F.3d 1084, 1091 (9th Cir. 2002). Defendants present no evidence to this end.

Second, Crider explains that he "performed all of the calculations and made all of the necessary adjustments to the computer program to simulate the flight path of TWA flight 800 for the NTSB." *Crider Decl*., at ¶¶ 19, 24. Although Crider may have used his "engineering knowledge and professional judgment" in making these decisions, *see Id*. at ¶ 20, there is no evidence that, by reviewing the disclosed source file, a reader would be able to understand or reconstruct the NTSB's deliberative process. *See Assembly*, 968 F.2d at 922-23.

Finally, Crider states that management reviewed and commented on his work after the initial simulation was completed. *See Crider Decl*., at ¶ 19. However, there is no allegation, much less evidence, that disclosure of this program would disclose the content of that review and content. Indeed, generally speaking, Crider does not claim that the disclosure of the program would "expose an agency's decisionmaking

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process in such a way as to discourage candid discussion within the agency and thereby undermine the agency's ability to perform its functions."[36] *See Assembly*, 968 F.2d at 921 (quotation omitted). His simulation program was merely a tool used in connection with other data to derive a result based upon that data. Defendants have failed to carry their burden that what has been withheld "represent[ed] the mental processes of the agency in considering alternative courses of action prior to settling on a final plan." *Nat'l Wildlife Fed'n*, 861 F.2d at 1122. Therefore, I DENY Defendants' use of Exemption 5 and the deliberative process privilege to withhold this record.

III. Conclusion

For the foregoing reasons, the Court GRANTS summary judgment as to Plaintiff's Records 9, 23, 27 (in part), 28 (in part), 43 and 74 (in part). For Records 27 and 28, Defendants shall produce the title, date, bolded sub-titles and (in the case of Record 28) Figure 1 and the Appendix. For Record 74, Defendants shall produce everything but the "Comments" column and the handwritten notes. The Court DENIES Defendants' summary judgment motions as to all the other disputed Records.

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[36]   Conversely, Crider does make such a claim concerning the release of the input and output files-used in connection to this simulation program. *Supp. Crider Decl.*, at ¶ 10.

National Transportation Safety Board

Washington, D.C. 20594

June 13, 2008

Captain H. Ray Lahr, USN (ret.)
18254 Coastline Drive
Malibu, California 90265-5704

> Re: *Lahr v. National Transportation Safety Board (NTSB), et al.*, CV 03-8023-AHM (RZx), U.S.D.C. for CA
> Freedom of Information Act (FOIA) Release of Records
> NTSB Accident No.: DCA96MA070 (TWA flight 800)

Dear Captain Lahr:

Pursuant to the Honorable A. Howard Matz's opinions dated August 31 and October 4, 2006, and the Judgment of the Court dated October 17, 2006, the Safety Board includes with this letter the agency records that the Court ordered the Board to produce. The Safety Board searched for and produces these records in response to your requests under the FOIA in which you sought, "the NTSB's zoom-climb data and calculations in order to validate or invalidate the NTSB's and CIA's zoom-climb[1] conclusions."

Specifically, the Safety Board is producing the following records:

NTSB Record 6 – 4 pages including graph and chart depicting the lift coefficient of Boeing Model 747 aircraft; graph and chart depicting pitching moment coefficient of Boeing Model 747 aircraft

NTSB Record 8 – 3 graphs and 2 charts depicting the lift coefficient, pitching moment coefficient, and the drag coefficient of Boeing Model 747 aircraft

NTSB Record 15 - computer program written by NTSB staff to simulate the flight path of aircraft is included on the CD. A memo describing the simulation also is included.

NTSB Record 27 – 15 pages from table tracking the location in the ocean of debris from TWA flight 800. Please note that although the Court allowed the agency to withhold the

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[1] In your October 8, 2003 letter, you describe the "zoom-climbs" as "the aircraft's (sic) continuing to fly after the nose of TWA 800 was blown off, climbing as much as 3,200 feet."

000001

information contained in the "Comments" column and the handwritten notes, the agency has chosen to make a discretionary release of this information.

NTSB Record 33 – 9 pages of charts of segments of radar data

NTSB Record 34 – 29 graphic representations of FAA radar data for TWA flight 800

NTSB Record 35 – 10 graphic representations of NTSB TWA flight 800 Main Wreckage Simulation

NTSB Record 36 – 62 pages of charts of segments of radar data

Also enclosed are the software programs entitled, "Ballistic" and "Breakup." The enclosed disk contains executable files for both Ballistic and Breakup, and input files used for these programs for the flight path study of TWA 800. The disk also contains the source code for Breakup; no source code, however, exists for the version of Ballistic that the Safety Board used during the TWA 800 investigation.

The Safety Board's Office of General Counsel has informed me that because these records are being produced in accordance with a court order, to the extent I have denied your FOIA request, you may address my decision in your litigation.

Sincerely,

Melba D. Moye
FOIA Officer

Enclosures
cc: GC-1 (Silbaugh)

NTSB COVER LETTER DESCRIPTIONS

ONE

NTSB Record 6
— 4 pages including graph and chart depicting the lift coefficient of Boeing Model 747 aircraft; graph and chart depicting pitching moment coefficient of Boeing Model 747 aircraft

SIMULATION PROGRAM

Although the Freedom of Information Act (FOIA) does not require an explanation of a record produced, the National Transportation Safety Board (NTSB) has chosen to provide a brief description of the simulation program that is being produced pursuant to Judge A. Howard Matz's opinion and subsequent order in *Lahr v. NTSB, et al.,* CV 03-8023-AHM (RZx), U.S.D.C. for CA (2003).

As the Safety Board stated throughout the litigation, this simulation program was used for investigations prior to, and after, the TWA 800 investigation. Thus, the code has evolved over time, and no longer exists in the form used for the TWA 800 investigation. Further, throughout the investigation, the aerodynamic source code was changed to investigate variable failure modes and there was no code that could be pointed to as the definitive TWA 800 simulation program. However, only one version of TWA 800 unique aerodynamic source code, a component of the simulation program, was located. Therefore, it is not possible for the Safety Board to produce the exact code used for the TWA 800 reports.

Nonetheless, the Safety Board took steps to comply with the Judge's order to provide an executable program. To reconstruct the code, the Safety Board located versions of source code from the TWA 800 time period. The source files were edited so they would compile and link together (these edits are commented in the source code). As a part of this process, calls to the non-responsive, non-relevant code for other airplanes were eliminated. The Safety Board reconstructed a set of source code that when compiled and linked with the identified TWA 800 aerodynamic, engine and mechanical controls source code, produces an executable program.

The Safety Board ran the reconstructed executable with a set of input files used during the time period of the drafting of the Addendum II to Main Wreckage Flight Path Study. The results were plotted against simulation results from June 2000 that we believe were imported into Addendum II. The reconstructed code duplicated the results from the June 2000 simulation output until the time of the outboard wing panel failure. The plots comparison plots are included below.

TWA 800
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

As seen in the plots above, the reconstructed code could not reproduce the flight path from the Addendum II to Main Wreckage Flight Path Study past the time of the outboard wing panel failure. This indicates that the preserved version of the TWA 800 aerodynamic code was edited for further iterations after the simulation runs used in Addendum II.

All of the source code contains include statements that bring in external header files to the source files when they are compiled. While some of these header files are standard C/C++ headers, others define data structures that are used to communicate between the modules. Data structure header files from the time of the TWA 800 investigation were found and the include statements in each source file replaced with includes pointing to these older header files.

PRODUCTIONS OF 2 AND 3 APPEAR IN ORDER NTSB PRODUCED

TWO

NTSB Record 8
— 3 graphs and 2 charts depicting the lift coefficient, pitching moment coefficient, and the drag coefficient of Boeing Model 747 aircraft

THREE

NTSB Record 15
- computer program written by NTSB staff to simulate the flight path of aircraft is included on the CD. A memo describing the simulation also is included.

BOEING PROPRIETARY

PRELIMINARY

C_L

Note:
1. Rigid Data
2. Stab Angle = 0 deg
3. Elevators at 0 deg

Baseline

Baseline w/o fwd body

Wing Angle-of-Attack ~Deg

BOEING PROPRIETARY

CALC	Overton	24Mar97	REVISED	DATE	Lift Coefficient	747-100
CHECK					Effect of Loss of Forward Body	
APPD.					Flaps and Gear Up Mach = .6	
APPD.					BOEING	PAGE

BOEING PROPRIETARY

PRELIMINARY

Note:
1. Rigid Data
2. Stab Angle = 0 deg
3. Elevators at 0 deg

Wing Angle-of-Attack ~Deg

$C_{M_{.25c}}$

BOEING PROPRIETARY

CALC	Overton	24Mar97	REVISED	DATE	Pitching Moment Coefficient	747-100
CHECK					Effect of Loss of Forward Body	
APPD.					Flaps and Gear Up Mach = .6	
APPD.					*BOEING*	PAGE

BOEING PROPRIETARY
PRELIMINARY

3/24/97

Baseline minus Forward Body

Wing Angle-of-Attack ~ deg. ALW	Lift Coeff. CLBA	Pitching Moment Coeff. About 25%MAC CMBA
-10	-0.991	0.41
0	-0.1293	0.032
1	-0.03775	-0.005001
2	0.0578	-0.042001
3	0.1504	-0.0745006
4	0.243	-0.1055
5	0.333	-0.133
5.5	0.379	-0.145
5.8	0.4066	-0.1526
6	0.425	-0.157
6.2	0.4426	-0.1625
6.5	0.469	-0.1705
7	0.515	-0.183
7.5	0.5615	-0.1935
8	0.606	-0.2045
8.25	0.62825	-0.209
8.5	0.6505	-0.211
8.75	0.66825	-0.211
9	0.686	-0.21
9.5	0.729	-0.2045
10	0.764	-0.197
10.5	0.8015	-0.1891
11	0.833	-0.18
12	0.891	-0.173
13	0.937	-0.182
13.5	0.962308	-0.187231
14	0.987615	-0.195462
14.5	1.003	-0.208286
15	1.008	-0.225
16	1.0115	-0.261
17	1.015	-0.303
18	1.0265	-0.351
19	1.038	-0.4275
20	1.05133	-0.504
25	1.118	-0.8675
30	1.185	-1.231

BOEING PROPRIETARY

000011

BOEING PROPRIETARY
PRELIMINARY

3/24/97

Baseline Configuration

Wing Angle-of-Attack – deg. ALW	Lift Coeff. CLBA
-10	-0.931
0	0.0147
2	0.2038
4	0.393
5	0.486
6	0.579
6.5	0.624
7	0.671
7.5	0.716
8	0.759
8.5	0.802
9	0.836
9.5	0.872
10	0.9
10.5	0.922
11	0.938
12	0.965
13	0.982
14	0.998
15	1.008
17	1.015
19	1.038
25	1.118
30	1.185

Wing Angle-of-Attack – deg. ALW	Pitching Moment Coeff. About 25%MAC CMBA
-10	0.367
0	0.087
1	0.058999
2	0.030999
3	0.0044994
4	-0.0215
5	-0.045
5.5	-0.056
5.8	-0.063
6	-0.067
6.2	-0.0715
6.5	-0.078
7	-0.088
7.5	-0.098
8	-0.1085
8.25	-0.113
8.5	-0.115
8.75	-0.115
9	-0.114
9.5	-0.1095
10	-0.103
10.5	-0.0966
11	-0.089
12	-0.087
13	-0.108
13.5	-0.124
14.5	-0.164
14	-0.143
15	-0.185
16	-0.231
17	-0.285
18	-0.351
20	-0.504
30	-1.231

BOEING PROPRIETARY

PRELIMINARY

C_L

Note:
1. Rigid Data
2. Stab Angle = 0 deg
3. Elevators at 0 deg

Wing Angle-of-Attack ~Deg

CALC	Overton	5 Apr 97	REVISED	DATE	Lift Coefficient	747-100
CHECK					Effect of Loss of Forward Body	
APPD.					Flaps and Gear Up Mach = .6	
APPD.					BOEING PROPRIETARY	

BOEING

PRELIMINARY

C_M .25c

Note:
1. Rigid Data
2. Stab Angle = 0 deg
3. Elevators at 0 deg

Wing Angle-of-Attack "Deg

CALC	Overton	4Apr97	REVISED	DATE	Pitching Moment Coefficient	747-100
CHECK					Effect of Loss of Forward Body	
APPD.					Flaps and Gear Up Mach = .6	
APPD.						

BOEING PROPRIETARY

BOEING

Note:
1. Rigid Data
2. Stab Angle = 0 deg
3. Elevators at 0 deg

PRELIMINARY

C_D

[A]: /acct/1go4485/1n11d/11zal_ddleln.esb

CALC	Overton	3Apr97	REVISED	DATE	Drag Coefficient	747-100
CHECK					Effect of Loss of Forward Body	
APPD.					Flaps and Gear Up Mach = .6	
APPD.						

BOEING PROPRIETARY

BOEING PROPRIETARY
PRELIMINARY

4/4/97

Baseline minus Forward Body

Wing Angle-of-Attack – deg.	Drag Coeff.	Lift Coeff.	Pitching Moment Coeff. About 25%MAC
ALW	CDBA	CLBA	CMBA
-10	0.198922	-0.820969	0.402749
-8	0.166493	-0.653834	0.336691
-7	0.150278	-0.570266	0.303662
-6	0.134063	-0.486699	0.270633
-5	0.122484	-0.403131	0.237605
-4	0.110905	-0.319563	0.204576
-3	0.101708	-0.235996	0.171547
-2	0.0925116	-0.152428	0.138518
-1	0.0881946	-0.0688605	0.105489
0	0.0855776	0.0147073	0.07246
1	0.0844177	0.098196	0.0399679
2	0.0850179	0.181685	0.00760186
3	0.0870951	0.265223	-0.0234525
4	0.0904463	0.348762	-0.0543554
5	0.0944376	0.430589	-0.0830046
5.5	0.0969306	0.471404	-0.0967404
5.8	0.0986298	0.495939	-0.105409
6	0.099888	0.512127	-0.110661
6.2	0.101058	0.527719	-0.116363
6.5	0.103091	0.551234	-0.12464
7	0.106968	0.592555	-0.13787
7.5	0.111886	0.631877	-0.151233
8	0.118311	0.669198	-0.165465
8.25	0.122624	0.687866	-0.17205
8.5	0.127069	0.706534	-0.176384
8.75	0.131578	0.720702	-0.178561
9	0.136086	0.73487	-0.179884
9.5	0.146403	0.765206	-0.179993
10	0.155433	0.787541	-0.179026
10.5	0.164854	0.810922	-0.171655
11	0.175724	0.832589	-0.159667
12	0.197921	0.875176	-0.145765
13	0.222423	0.9084	-0.16252
13.5	0.234669	0.924786	-0.176635
14	0.248416	0.941172	-0.193751
14.5	0.262084	0.956721	-0.21125
15	0.275753	0.975451	-0.229034
16	0.305034	1.00231	-0.270243
17	0.335717	1.015	-0.32236
18	0.365469	1.0265	-0.388934
19	0.39513	1.038	-0.466016
20	0.426815	1.05133	-0.543098
25	0.569988	1.118	-0.909754
30	0.71944	1.185	-1.27698

BOEING PROPRIETARY

BOEING PROPRIETARY
PRELIMINARY

4/4/97

Baseline Configuration

Wing Angle-of-Attack ~ deg.	Drag Coeff.	Lift Coeff.	Pitching Moment Coeff. About 25%MAC
ALW	CDBA	CLBA	CMBA
-10	0.136	-0.931	0.367
-8	0.1025	-0.74186	0.311
-7	0.08575	-0.64729	0.283
-6	0.069	-0.55272	0.255
-5	0.057	-0.45815	0.227
-4	0.045	-0.36358	0.199
-3	0.0355	-0.26901	0.171
-2	0.026	-0.17444	0.143
-1	0.0215	-0.07987	0.115
0	0.0187	0.0147	0.087
1	0.0174789	0.10925	0.058999
2	0.0180179	0.2038	0.030999
3	0.0201563	0.2984	0.0044994
4	0.0235687	0.393	-0.0215
5	0.027743	0.486	-0.045
5.5	0.0303275	0.5325	-0.056
5.8	0.0320816	0.5604	-0.063
6	0.0333764	0.579	-0.067
6.2	0.0346069	0.597	-0.0715
6.5	0.0367306	0.624	-0.078
7	0.0407597	0.671	-0.088
7.5	0.045829	0.716	-0.098
8	0.0524065	0.759	-0.1085
8.25	0.0568248	0.7805	-0.113
8.5	0.0613748	0.802	-0.115
8.75	0.0659886	0.819	-0.115
9	0.0706024	0.836	-0.114
9.5	0.0811292	0.872	-0.1095
10	0.09037	0.9	-0.103
10.5	0.100059	0.922	-0.0966
11	0.111197	0.938	-0.089
12	0.133929	0.965	-0.087
13	0.159075	0.982	-0.108
13.5	0.171644	0.99	-0.124
14	0.185713	0.998	-0.143
14.5	0.199756	1.003	-0.164
15	0.213799	1.0084	-0.190293
16	0.243829	1.01206	-0.239609
17	0.275359	1.015	-0.285
18	0.305958	1.0265	-0.351
19	0.336557	1.038	-0.4275
20	0.369179	1.05133	-0.504
25	0.517745	1.118	-0.8675
30	0.673321	1.185	-1.231

BOEING PROPRIETARY

FOUR

NTSB Record 27
— 15 pages from table tracking the location in the ocean of debris from TWA flight 800. Please note that although the Court allowed the agency to withhold the information contained in the "Comments" colunm and the handwritten notes, the agency has chosen to make a discretionary release of this information.

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a004 ✓	40 38 41.29	-72 39 15.25	FS 760-960 STR 22R-37R, p/n 6580173			0
a006 ✓	40 38 44.90	-72 39 15.49	#3 pos air cycle machine/heat exchanger w/ ducts, dual heat exchanger #3			0
a015 ✓	40 38 54.80	-72 39 09.90	galley C structure			0
a018 ✓	40 38 38.54	-72 39 08.77	CW front spar RBL 66-LBL 28, (8x6 frame # 65B1029858 front spare BLO)		lat long matches target database (phil 9/27/96)	0
a021	was 40 38 44.70 40 38 44.94	-72 39 08.97 ✓	wing front spar web, LBL 20-70		confirmed L/L from tgt # - DMR 10/4/96	0
a022 ✓	40 38 41.57	-72 39 07.30	FS 780-920 STR 23L-37L		confirmed L/L from tgt # - DMR 10/4/96	0
a027 ✓	40 38 39.45	-72 39 15.00	2 coach seats # stenciled on frame 823566404		L/L changed slightly to reflect target location - DMR 10/4/96	0
a029 ✓	40 38 43.19 ✓	-72 39 19.80 ✓	forward lower cargo bay structure FS 900-960 LH CW w/ motor and wheels, p/n 747-5100-5-0		confirmed L/L from tgt # - DMR 10/4/96	0
a030 ✓	40 38 43.63	-72 38 28.78	2 seats, one red, one blue # row 11 seat 6		confirmed L/L from tgt # - DMR 10/4/96	0
a032 ✓	40 38 41.77	-72 39 06.83	hatch :part # 65B10020-574, serial # 000160, manufacturer code 82918		L/L changed slightly to reflect target location - DMR 10/4/96	0
a033 ✓	40 38 39.55	-72 39 07.45	FS 800-840 STR 13R-16R with R2 door frame		L/L changed slightly to reflect target location - DMR 10/4/96	0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a040	40 38 30.23	-72 38 56.20	framing curved		L/L changed slightly to reflect target location - DMR 10/4/96	0
a042	40 38 42.10	-72 39 18.53	piping/U shaped 8', # 65B4093-5-1, bleed air tubing, #3 pack ducting, forward end		L/L changed slightly to reflect target location - DMR 10/4/96	0
a055	40 38 35.96	-72 39 20.71	#2 ram air duct		description from divelog - JAC 12/03/96	0
a060	40 38 47.00	-72 39 13.40	seat 18 (4 5 6 7)			0
a070	40 38 41.77	-72 39 06.83	gear door, 65B10020-574,		Lat/long matches target database, no wreckage log (Phil 9/25/96)	0
a071	40 38 43.10	-72 39 19.80	FS 740-780 STR 15R-26R with R2 door attached, #5804951 7 on bottom inner door frame			0
a102	40 38 59.74	-72 39 02.41	2-1/2'x3' piece of wreckage, 3 castor wheels		confirmed L/L from tgt # - DMR 10/4/96	0
a103	40 38 33.03	-72 38 52.61	2 small pieces of frame 1"x1"x3' (left leg to seats 17 (1 2 3)		L/L changed slightly to reflect target location - DMR 10/4/96	0
a104	40 38 42.70	-72 38 57.46	lighting strut, clothing		confirmed L/L from tgt # -DMR 10/4/96 NOTE seat tag does not exist in cabin hangar as of 10/18/96)	0
a109	40 38 37.29	-72 39 12.46	floor beam with seat track, FS 840-880, RBL 33.99		confirmed L/L from tgt # - DMR 10/4/96	0
a113	40 38 44.55	-72 39 11.93	chrome brazing		L/L changed by several seconds to reflect target location - DMR 10/4/96	0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a117	40 38 22.20	-72 38 42.70	2"x4' green frame		confirmed L/L from tgt # - DMR 10/4/96	0
a119	40 38 45.08	-72 39 08.48	wire plug DL9404		L/L changed slightly to reflect target location - DMR 10/4/96	0
a126	40 38 35.38	-72 38 08.94	fuselage FS 940-820 STR 6L-17L			0
a130	40 38 39.44	-72 38 16.82	p/n 863703 dispenser for head		L/L changed slightly to reflect target location - DMR 10/4/96	0
a131	40 38 31.09	-72 38 58.69	forward lower cargo bay structure FS 860-880 left hand cargo floor		L/L changed slightly to reflect target location - DMR 10/4/96	0
a133	40 38 29.19	-72 39 02.40	#1 heat exchanger ram air door		confirmed L/L from tgt # - DMR 10/4/96	0
a136	40 38 40.86	-72 38 45.07	L2 door 65B04425-411, escape door hatch, 65B15830 403# on the inner door by latch			0
a141	40 38 34.48	-72 39 00.37	FS 800-1000 STR 40L-40R with forward lower cargo bay structure w/rollers attached		confirmed L/L from tgt # - DMR 10/4/96	0
a147	40 38 48.80	-72 39 18.30	blower assembly w/ piping part # 1923, ACM #1; casting p/n 18488, ACM valve turbo bypass, p/n 719223-3 p9 747, 6CB00026-27 B A14694		L/L changed slightly to reflect target location - DMR 10/4/96	0
a154	40 38 33.79	-72 38 40.07	fair lead assembly 3'		no target #, confirmed wreckage Log L/L	0
a158	40 38 30.10	-72 38 51.96	seat 16 (10) seat with no back; red seat back w/ frame; fiberglass round dome 2 1/2' diameter		L/L changed slightly to reflect target location - DMR 10/5/96	0

000021

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a160	40 38 47.24	-72 39 20.58	flow control valve s/n SNKB5189-764476-2 P214-9, #3 pack		L/L changed slightly to reflect target location - DMR 10/5/96	0
a167	40 38 42.21	-72 38 50.28	seat track RBL 33-99 FS 800-840, clothing		L/L changed slightly to reflect target location - DMR 10/5/96	0
a169	40 38 37.71	-72 38 38.95	2.5x2.5 fiberglass w/PBE holder p/n 4566M37-B-042NM s/n E955016			0
a172	40 38 34.34	-72 39 00.14	seat 17 (8 0) armrest; light alum framing; 2' and 3' long		confrimed L/L from target position in target database - DMR 10/5/96	0
a181	40 38 48.07	-72 38 35.95	FS 820-900, STR 14L-25L		moved latitude 5 seconds to the south to reflect the L/L for tgt # LLS177 in the tgt database - DMR 10/5/96	0
a182	40 38 31.07	-72 38 56.26	forward lower cargo bay structure FS 800 right hand side		L/L changed slightly to reflect target location - DMR 10/5/96	0
a183	40 38 31.07	-72 38 56.26	3 small pieces, 18" long assembly 65B41247-79		L/L changed slightly to reflect target location - DMR 10/5/96	0
a190	40 38 31.03	-72 38 59.00	fiberglass framing 3x3x3		L/L changed slightly to reflect target location - DMR 10/5/96	0
a2003	40 38 20.94	-72 38 28.49	FS 920 frame STR 17R-20R	SOURCE TAG CORRECTED FROM A525 TO A520		0
a2031	40 38 21.75	-72 38 27.64	body crown fuselage	LOT# UPDATED PER 2000 SERIES AUDIT, CHANGED FROM B561TO MATCH ACTUAL DEBRIS		0
a2045			seat track RBL 11.33 FS 940-960	NO LOT#, CHANGED FROM RED TO WHT PER 2000 SERIES AUDITNO LOT#, CHANGED FROM RED TO		-1

(handwritten) NOT EXEMPT (Pos. is "BEST GUESS")

(handwritten) EXEMPT (OK TO USE)

(handwritten) WHITE (Pos'n unk.)

(handwritten) Position same ... ugh... OK

000022

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a209	40 38 35.92	-72 38 44.95	nose gear door/hatch p/n 65B10019-2, 3'x6'x4" thick, RH nose gear wheel well door/first 6', joins A152		L/L changed slightly to reflect target location - DMR 10/5/96	0
a210	40 38 32.43	-72 38 37.87	SWB #3, mid RH, p/n 65B10683 2		confrimed L/L from target position in target database - DMR 10/5/96	0
a212	40 38 21.82	-72 38 25.96	FS 940-1000 STR 9R-15R		confrimed L/L from target position in target database - DMR 10/5/96	0
a219	40 38 44.45	-72 38 56.32	food warmer box 8"x20"x14" plastic TWA 44-0842		confrimed L/L from target position in target database - DMR 10/5/96	0
a227	40 38 39.15	-72 38 52.96	SWB #3, RBL 23 to LBL 20, p/n 65B01110-19		confrimed L/L from target position in target database - DMR 10/6/96	0
a227	40 38 39.15	-72 38 52.96	SWB #3, RBL 23 to LBL 20, p/n 65B01110-19		confrimed L/L from target position in target database - DMR 10/6/96	0
a233	40 38 30.38	-72 39 04.30	alum strut 4' long, circular tubing 18" diam, rubber/plastic with metal strap, assembly 65341207-1			0
a236	40 38 45.26	-72 39 51.96	front spar RH web, LBL 75-115		confrimed L/L from target position in target database - DMR 10/6/96	0
a238	40 38 31.08	-72 39 05.10	SWB #3, front spar web, RBL 66-45			0
a239	40 38 30.60	-72 39 04.56	wire basket/ rubber coated 2"x2 1/2"x4"/6"x4" framing/ 2'x1" strut			0
a242	40 38 12.43	-72 38 12.68	forward lower cargo bay structure FS 880 center line			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a249	40 39 09.49	-72 38 31.92	galley A kitchen/galley ovens, A6, A5a, A5b, A5c, A5d (3 pieces)	Debris field changed per FBI Lot# audit for out-of-area tags.	Lat/long verified with tgt and wreckage logs (phil 9/26/96)	-1
a251	40 38 30.38	-72 39 04.30	3 piece framing 1.5'x2.5'	→ THE COLOR WAS WRONG, BUT POS'n OK.		0
a252	40 38 26.39	-72 38 34.66	FS 800-880 STR 36L-40L		Lat/long verified with tgt and wreckage logs (phil 9/26/96)	0
a254	40 38 27.14	-72 38 34.54	18" light braising, 1'x6" alum bulkhead			0
a260	40 38 31.20	-72 39 04.68	FS 980 lower frame STR 40L-42R			0
a265	40 38 50.28	-72 39 02.17	fuse box galley complete 6'x3"x2", galley B and C			0
a268	40 38 11.33	-72 37 31.77	FS 880-900 STR 1R-3R RH side 1'x1' fuselage crown skin/6"x2"x2" alum strut,		Lat/long on wreckage log matches Target # 40 in tgt databse (Phil 9/20/96)	0
a269	40 38 22.70	-72 38 33.40	exit sign w/ electronics, spring hinged arm, 4" 1/4" tubing			0
a272	40 38 28.51	-72 38 16.55	overhead flood light manufacturer p/n 30-0418-5/TWA 291-0191		longitude on wreckage log differs from target by 9.15" - JAC 12/03/96	0
a401	40 38 27.90	-72 38 45.31	12" green metal strut, 6"x2" yellow plastic w/black clip 162-1013-3		target longitude differs from wreckage by 8.03" - JAC 12/03/96	0
a404	40 38 46.79	-72 39 25.61	forward lower cargo bay structure FS 800-840 LH CW w/ motor and wheels (cargo floor 4'x3'x2', ac motor w/ brake p/n 747-5826-1-0, s/n 5475)			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a405	40 38 42.99	-72 39 29.48	4'x6"x2" strut			0
a413	40 38 59.90	-72 39 01.20	3'x2' molded metal			0
a421	40 37 54.37	-72 38 53.54	right side fuselage with 4 windows FS 860-940 STR 19R-25R		Lat/long Tgt and WL agree (phil + jim 10/17/96); This piece was cut, the section with 4 windows retains the tag	0
a423	40 38 23.70	-72 38 37.30	4'x1' framing and wire harness			0
a424	40 38 22.55	-72 38 34.25	FS 880-948 STR 2AR			0
a426	40 38 27.97	-72 38 29.96	upper part of galley B		(FBI # 8 14 96-11) Has a source tag of A425 (phil 11/2/96)	0
a430a	40 38 28.17	-72 38 49.64	frame #L220			0
a441	40 38 55.26	-72 39 19.08	projector			0
a444	40 38 36.99	-72 39 22.38	roller on track			0
a445	40 38 36.39	-72 39 19.99	insulated tubing 1120363320			0
a446	40 38 27.71	-72 38 48.87	3' bent metal # 86-4040			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a447	40 38 27.21	-72 38 48.87	8' wire, white			0
a448a	40 38 23.71	-72 38 37.78	small metal piece 3"x7"x0.25" metal			0
a449	40 38 27.71	-72 38 48.87	forward lower cargo bay structure FS 1000 left hand side			0
a449a	40 38 26.56	-72 38 38.30	small metal piece 3'x2' p/n: 65B08060-12n/c ADCN 1-2-3 7075-T6, s/n: 252 sept 11 1970			0
a451	40 38 26.76	-72 38 58.74	#1267448 - 65808074-39 green piece w/ gasket; horizontal stabilizer fairing			0
a452	40 38 25.73	-72 38 48.05	floor support			0
a453	40 38 26.08	-72 38 48.49	forward lower cargo bay structure FS 920 left hand side			0
a454	40 38 24.53	-72 38 48.31	arm rest			0
a455	40 38 25.67	-72 38 46.82	access door frame			0
a459	40 38 28.11	-72 39 02.61	front spar web and stiffener			0
a462	40 38 17.80	-72 38 32.84	forward lower cargo bay structure FS 960 right hand side			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a469	40 38 24.11	-72 38 44.40	overhead light			0
a470	40 38 25.71	-72 39 06.68	forward lower cargo bay structure FS 820 right hand side			0
a471	40 38 24.28	-72 39 06.17	1'x1" broken heavy metal strut			0
a474	40 38 24.40	-72 38 38.59	1.5' long framing and various small pieces			0
a475	40 38 32.09	-72 38 55.64	SWB #3, LH web, LBL 20-83			0
a476	40 38 23.46	-72 38 31.94	FS 840-880 STR R1-R6			0
a479	40 38 31.20	-72 38 54.42	1'x4" alum strut			0
a484	40 38 27.71	-72 38 48.87	strut p/n 65B41247-83 and 84			0
a486	40 38 28.17	-72 38 49.64	1.5' frame			0
a487	40 38 39.30	-72 39 17.22	1) 2.5"x1"x1" BAC27EBY-51 2) 18"x1"x2" metal ASSY 69B60682-1			0
a488	40 38 36.99	-72 39 20.25	ram air inlet screen			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a489	40 38 24.48	-72 38 27.12	frame FS 900 lower LBL 7-26			0
a491	40 38 23.06	-72 38 17.78	light framing with trim "ASSY 65B54_ _ _ "			0
a497	40 38 31.20	-72 38 54.42	body fairing		target not supported by wreckage log - JAC 12/03/96	0
a500	40 38 32.60	-72 38 38.37	front spar web RBL 76		wreckage log lat/long differ from target by approx. 20" - JAC 12/03/96	0
a504	40 38 32.87	-72 39 10.47	10' heavy framing			0
a508	40 38 32.10	-72 38 58.08	6' strut, 9302356 on framing			0
a512	40 38 24.40	-72 38 38.59	personal effects			0
a521	40 38 22.97	-72 38 29.33	1) rubber window molding 2) piece of insulation with plastic latch 3) angled plastic molding 6"x3" p/n 162-103-8			0
a522	40 38 23.87	-72 38 34.01	6' piece of red wire			0
a523	40 38 32.10	-72 38 58.08	1) fluorescent light fixture p/n BR6219-401 2) bracket 4"x18" 3) small 3" piece of plastic			0
a524	40 38 31.77	-72 38 55.37	1) metal frame with electric plug and wire assy "69B71009-1" 2) metal tube 12" assy 65B41247.79			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a525	40 38 26.42	-72 38 39.48	several small pieces of wire			0
a533	40 38 30.66	-72 38 59.76	3 pieces: 1) metal 10"x18", 2) spring/hinge, small, 3) plastic cowling 6"x6"x2"			0
a534	40 38 31.77	-72 38 55.37	1) metal strap 4'x1" p/n 65B41247-5, 2) 4'x2"x11" possible fiberglass			0
a535	40 38 26.56	-72 38 38.30	1) metal 14"x6"x1.5" p/n 65B38600-137, 2) yellow oxygen mask, 3) 2.5' metal pipe 3/4" diameter plus hose and toggle switch			0
a536	40 38 30.66	-72 38 59.76	forward lower cargo bay structure FS 940 left hand side			0
a537	40 38 26.64	-72 39 01.31	fiberglass rib 3'x1'x3"			0
a541	40 38 13.98	-72 38 14.91	forward lower cargo bay structure FS 860 left hand side (5'x2.5'x1" metal piece p/n 65B107, also a 1.5'x2" metal piece)			0
a601	40 38 35.80	-72 39 09.00	forward lower cargo bay structure FS 800-840 centerline (FS 980 floor beam - LBL 20 to RBL 11; LF162 cut from LF31			0
a605	40 38 35.80	-72 39 09.00	right belly and cargo track between FS 800-940 STR 37R-44R			0
a606	40 38 33.1 40 38 34.80	72 39 11.10 -72 39 09.20	pile of debris: 4' piece of metal tubing, short 6" piece of framing with several screws, interior framing with w/ hydraulic lines attached, 2"x2" metal scrap, single (18") piece of rib with rivets.		wreckage log indicates multiple nearby locations for the debris - JAC 12/03/96	0
a610	40 38 37.56	-72 39 13.38	cargo bin structure, upper track (roller tray), bent twisted metal piece			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a614	40 38 28.29	-72 38 49.71	forward lower cargo bay structure FS 800 left hand side			0
a618	40 38 47.80	-72 39 08.40	front spar, LBL 60-95			0
a628	40 38 43.63	-72 39 13.03	trim air duct			0
a629	40 38 46.70	-72 39 11.60	ice hammer			0
a633	40 38 33.24	-72 39 05.70	duct work			0
a660	40 38 32.50	-72 38 53.40	long piece of framing			0
a669	40 38 31.93	-72 38 52.42	small frame section with green rod			0
a685	40 38 49.80	-72 39 27.50	lightweight material 4' long with motor on side			0
a708	40 38 20.80	-72 38 34.10	"Y" shaped metal with holes, overhead support			0
a712	40 38 20.00	-72 38 26.30	metal and plastic interior piece #1471078 1, 1471114 26, galley piece ?			0
a714	40 38 21.80	-72 38 43.80	structure framing 1'x3', white fiberglass support			0

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a719	40 38 28.80	-72 38 28.70	metal piece w/jagged edge 10" in length-green			0
a726	40 38 32.20	-72 38 35.00	small electrical access panel with 2 plugs			0
a728	40 38 34.20	-72 38 54.50	plastic door			0
a729	40 38 33.80	-72 38 57.00	rib w/ pulley; strut with wheels		description as rib w/ pulley unsupported - JAC 12/03/96	0
a730	40 38 31.20	-72 38 59.30	cargo floor			0
a734	40 38 25.50	-72 38 55.40	forward lower cargo bay structure FS 960 left hand side			0
a734	40 38 25.50	-72 38 55.40	forward lower cargo bay structure FS 960 left hand side			0
a735	40 38 29.80	-72 38 55.00	stringer			0
a736	40 38 31.50	-72 38 51.00	seat piece			0
a737	40 38 29.20	-72 38 52.80	white "L" shaped brace 2' long			0
a738	40 38 28.29	-72 38 49.71	structural member w/holes			0

000031

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
a741 ✓	40 38 32.40	-72 38 53.00	floor beam lower chord FS 880 LBL 5-25			0
a742 ✓	40 38 30.70	-72 38 54.50	ducting 900 RH Zone C			0
a744 ✓	40 38 29.20	-72 38 54.30	forward lower cargo bay structure FS 1000 left hand CW outer skin (canted press bulkhead w/some body skin)			0
a745 ✓	40 38 41.10	-72 39 04.30	panel, wires, 110v outlet (elec. relay panel, fwd cargo bin), p/n 65B40474-22 and 65B40476-10 RA164			0
a746 ✓	40 38 39.90	-72 39 05.50	small metal piece			0
a747 ✓	40 38 34.80	-72 39 01.90	part of cargo conveyor system			0
a748 ✓	40 38 34.70	-72 39 01.40	arm rest			0
a749 ✓	40 38 37.30	-72 38 59.00	air filter (galley)			0
a753 ✓	40 38 27.80	-72 39 14.80	fuselage STR, 7' section			0
a860 ✓	40 38 24.22	-72 38 45.25	piece of wire			0
~~b061~~	~~40 39 03.00~~	~~-72 38 32.00~~		Exempt tag. See keel beam documentation. Changed to A2048	No WL or Tgt information (phil 10/1/96); B061 changed to A2048 per diver report (JDC 11/9/96) ; location from early QA list - JAC 12/04/96	0

Handwritten note: NO INFO WAS FOUND TO SUPPORT this POSN. Corr3ct Posh For PI3CL is 40 38 41.29 -72 39 15.25

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
✓ b094	40 38 31.84	-72 38 24.90	ASSY part 65B54209-5, 2'x5' green alum folded w/holes	Debris field changed per FBI Lot# audit for out-of-area tags.	Lat/long verified with tgt and wreckage logs (phil 9/25/96) Mobile dive team NYPD-1/WB53-1	-1
✓ c091	40 38 26.58	-72 39 06.48	part of tire	Debris field changed per FBI Lot# audit for out-of-area tags.	lat long matches wreckage log and target database (phil 9/26/96)	-1
✓ c092	40 38 27.88	-72 39 10.07	metal part GD5340A wire attached	Debris field changed per FBI Lot# audit for out-of-area tags.	Lat/long verified with tgt and wreckage logs (phil 9/25/96)	-1
✓ c093	40 38 26.58	-72 39 06.48	seat part, tray table piece	Debris field changed per FBI Lot# audit for out-of-area tags.	Lat/long verified with tgt and wreckage logs (phil 9/25/96) FBI 8 19 96-9	-1
✓ (x2201)	40 38 05.24	-72 38 37.29	large section of metal (8'x6') changed from Z3453 to X2201 to match actual debris field	Source tag changed per FBI Lot# audit. Updated per FBI Lot# audit.		0

Exempt — OK to use

Tag	Latitude	Longitude	Description (Actual)	General Admin	Comments	Color
x3002 ✓	40 38 24.57	-72 38 43.94	FS 890-990 STR 40R			0
x3005 ✓	40 38 22.77	-72 39 06.67	FS 920 frame STR 2R-5R, approx 1' long curved piece of fiberglass			0
x3008 ✓	40 38 23.82	-72 38 40.48	"L" shaped plastic piece			0
z3572 ✓	40 38 24.01	-72 38 40.06	misc. metal	Debris field changed per FBI Lot# audit for out-of-area tags.		-1
z3573 ✓	40 38 23.77	-72 38 40.56	FS 880-930 STR 35L	Debris field changed per FBI Lot# audit for out-of-area tags.		-1
z3694 ✓	40 38 34.66	-72 39 18.72	misc. metal	Debris field changed per FBI Lot# audit for out-of-area tags.		-1

→ THESE ARE ALL OK TO USE — Pos'ns OK, TAg colors wrong.

000033

FIVE
NTSB Record 33
—9 pages of charts of segments of radar data

13

16 Dec 97

```
RHD data from Mike O'R 12/8/97 -- RHD secondaries
   TIME      RANGE   AZIMUTH   MODE C
   110.7     17.00   198.98    12800.
   122.4     16.25   195.64    12800.
   134.2     15.63   192.66    13000.
   146.0     15.13   188.44    13200.
   157.8     14.50   184.04    13200.
```

PJRT.13

12/10/97

RHD data from Mike O'R 12/8/97 - RHD secondaries

TIME	RANGE	AZIMUTH	MODE C
28:59.5	22.25	214.19	13000.
29:11.4	21.25	212.08	12800.
29:23.2	20.38	209.97	12800.
29:35.0	19.38	207.51	11700.
29:46.9	18.63	204.96	12700.
29:58.8	17.75	202.06	12800.
30:10.7	17.00	198.98	12800.
30:22.4	16.25	195.64	12800.
30:34.2	15.63	192.66	13000.
30:46.0	15.13	188.44	13200.
30:57.8	14.50	184.04	13200.

usn rp44-rag

12/12/97

ℓ usn rp44.ra3

RP44=Riverhead, NY

SITE	TIME	RANGE	AZIMUTH	MODE C
RP44	0028:59.5	22.25	214.19	13,000
RP44	0029:11.4	21.25	212.08	12,800
RP44	0029:23.2	20.38	209.97	12,800
RP44	0029:35.0	19.38	207.51	12,700
RP44	0029:46.9	18.63	204.96	12,700
RP44	0029:58.8	17.75	202.06	12,800
RP44	0030:10.7	17.00	198.98	12,800
RP44	0030:22.4	16.25	195.64	12,800
RP44	0030:34.2	15.63	192.66	13,000
RP44	0030:46.0	15.13	188.44	13,200
RP44	0030:57.8	14.50	184.04	13,200

11.8
11.4
11.8

21.4   - 11.8 x 2

20 Nov 87

ntsb.isp

(Sort.22)

16.22	21.516	126.914
16.22	21.609	126.387
20.91	21.609	127.969
20.91	21.516	127.705
20.91	22.016	124.189
25.61	21.563	127.881
25.46	22.266	123.574
30.30	21.563	127.266
30.15	22.422	123.223
35.02	22.266	124.805
34.87	22.469	122.695
39.56	22.578	122.52
39.56	22.469	122.52
44.26	22.734	122.52
48.96	22.875	122.432
53.80	21.859	125.947
58.50	22.328	125.156
63.19	22.375	124.98

```
0,31,16.22,0,21.516,126.914,0,2,7,0,,1876.22,1875.97
0,31,16.22,0,21.609,126.387,0,2,7,0,,1876.22,1875.97
0,31,20.91,0,21.609,127.969,0,2,3,0,,1880.91,1880.66
0,31,20.91,0,21.516,127.705,0,2,2,0,,1880.91,1880.66
0,31,20.91,0,22.016,124.189,0,2,3,0,,1880.91,1880.66
0,31,25.61,0,21.563,127.881,0,2,2,0,,1885.61,1885.36
0,31,25.46,0,22.266,123.574,0,2,7,0,,1885.46,1885.21
0,31,25.75,0,21.063,137.013,0,2,7,0,,1885.75,1885.5
0,31,30.3,0,21.563,127.266,0,2,1,0,,1890.3,1890.05
0,31,30.15,0,22.422,123.223,0,2,2,0,,1890.15,1889.9
0,31,35.02,0,22.266,124.805,0,2,3,0,,1895.02,1894.77
0,31,34.87,0,22.469,122.695,0,2,7,0,,1894.87,1894.62
0,31,39.56,0,22.578,122.52,0,2,7,0,,1899.56,1899.31
0,31,39.56,0,22.469,122.52,0,2,7,0,,1899.56,1899.31
0,31,44.26,0,22.734,122.52,0,2,7,0,,1904.26,1904.01
0,31,48.96,0,22.875,122.432,0,2,3,0,,1908.96,1908.71
0,31,53.8,0,21.859,125.947,0,2,1,0,,1913.8,1913.55
0,31,58.5,0,22.328,125.156,0,2,4,0,,1918.5,1918.25
0,32,3.19,0,22.375,124.98,0,2,1,0,,1923.19,1922.94
```

ntsb.isp

19Nov57

ntsb.jfk

16.75	50.25	102.041
16.75	50.469	101.865
21.35	50.875	101.602
21.35	50.688	102.041
21.35	50.406	101.953
21.35	50.313	102.129
25.98	50.25	101.602
25.98	50.813	101.777
25.98	51.25	101.602
25.98	50.625	102.129
25.98	50.438	102.217
30.59	51.500	101.25
30.59	50.688	101.689
30.59	51.094	102.041
30.59	50.375	102.041
35.07	51.656	100.898
35.22	51.188	101.602
35.22	50.500	102.129
39.71	51.750	101.162
39.71	51.688	101.074
39.83	51.219	101.602
44.31	51.781	100.459
44.31	51.938	101.074
44.46	50.563	102.129
44.46	51.250	101.689
48.92	51.938	100.986
49.07	52.063	101.25
49.07	50.531	101.777
49.07	50.906	101.865
53.56	52.000	100.898
53.56	52.094	101.074
53.71	50.563	102.305
58.17	52.156	100.898
58.17	52.063	100.986
58.31	51.250	101.865
62.95	51.281	101.602
62.8	52.125	100.986
62.95	50.438	102.129

19N0097

htsb.jfk

```
0,31,16.46,0,31.563,83.76,0,0,7,0,,1876.46,1876.21
0,31,16.75,0,50.469,101.865,0,0,7,0,,1876.75,1876.5
0,31,21.35,0,50.875,101.602,0,0,7,0,,1881.35,1881.1
0,31,21.35,0,50.688,102.041,0,0,6,0,,1881.35,1881.1
0,31,21.35,0,50.406,101.953,0,0,7,0,,1881.35,1881.1
0,31,21.35,0,50.313,102.129,0,0,7,0,,1881.35,1881.1
0,31,25.98,0,50.25,101.602,0,0,5,0,,1885.98,1885.73
0,31,25.98,0,50.813,101.777,0,0,7,0,,1885.98,1885.73
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0,31,25.98,0,50.438,102.217,0,0,4,0,,1885.98,1885.73
0,31,30.59,0,51.5,101.25,0,0,7,0,,1890.59,1890.34
0,31,30.59,0,50.688,101.689,0,0,5,0,,1890.59,1890.34
0,31,30.59,0,51.094,102.041,0,0,6,0,,1890.59,1890.34
0,31,30.59,0,50.375,102.041,0,0,6,0,,1890.59,1890.34
0,31,35.07,0,51.656,100.898,0,0,7,0,,1895.07,1894.82
0,31,35.22,0,51.188,101.602,0,0,7,0,,1895.22,1894.97
0,31,35.22,0,50.5,102.129,0,0,5,0,,1895.22,1894.97
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0,31,39.71,0,51.688,101.074,0,0,7,0,,1899.71,1899.46
0,31,39.83,0,51.219,101.602,0,0,5,0,,1899.83,1899.58
0,31,44.31,0,51.781,100.459,0,0,4,0,,1904.31,1904.06
0,31,44.31,0,51.938,101.074,0,0,7,0,,1904.31,1904.06
0,31,44.46,0,50.563,102.129,0,0,5,0,,1904.46,1904.21
0,31,44.46,0,51.25,101.689,0,0,4,0,,1904.46,1904.21
0,31,48.92,0,51.938,100.986,0,0,7,0,,1908.92,1908.67
0,31,49.07,0,52.063,101.25,0,0,7,0,,1909.07,1908.82
0,31,49.07,0,50.531,101.777,0,0,5,0,,1909.07,1908.82
0,31,49.07,0,50.906,101.865,0,0,5,0,,1909.07,1908.82
0,31,53.56,0,52,100.898,0,0,6,0,,1913.56,1913.31
0,31,53.56,0,52.094,101.074,0,0,6,0,,1913.56,1913.31
0,31,53.71,0,50.563,102.305,0,0,5,0,,1913.71,1913.46
0,31,58.17,0,52.156,100.898,0,0,7,0,,1918.17,1917.92
0,31,58.17,0,52.063,100.986,0,0,7,0,,1918.17,1917.92
0,31,58.31,0,51.25,101.865,0,0,7,0,,1918.31,1918.06
0,32,2.95,0,51.281,101.602,0,0,5,0,,1922.95,1922.7
0,32,2.8,0,52.125,100.986,0,0,6,0,,1922.8,1922.55
0,32,2.95,0,50.438,102.129,0,0,7,0,,1922.95,1922.7
```

Data typed in from listing from NTSB file NVYALL1.CSV

Time(s)	Range	Azimuth
21.4	13.75	175.25
33.3	13.25	170.33
45.2	13.13	168.84
57.1	13.25	168.05
69.0	13.25	168.31

Data typed in from listing from NTSB 12 Nov 97

Time(s)	X	Y
14.64	19.5940	-8.7756
24.04	20.7970	-7.7169
24.04	19.4841	-9.1837
28.75	20.9738	-7.7106
28.75	19.1684	-9.6679
28.75	19.7022	-9.2063
33.44	21.1818	-7.5339
33.44	19.2493	-9.6182
33.44	19.6201	-9.1626
33.44	20.0512	-8.6423
38.13	21.2604	-7.4789
38.13	19.3281	-9.4733
38.13	19.9714	-8.6942
38.13	20.1898	-8.7139
42.83	20.7566	-8.2555
42.83	21.1938	-7.7247
42.83	21.4527	-7.2921
42.83	19.3695	-9.4957
47.52	21.4858	-7.5872
47.52	21.2664	-7.5748
47.52	19.6032	-9.0601
52.22	20.4911	-8.1223
52.22	21.2300	-7.6502
52.22	19.4642	-9.4531
52.22	20.0435	-8.4520
75.71	19.6995	-9.1112

SEN3.XYZ

HPN primaries with
12.3° mag, XY rel to ISP

SIX
NTSB Record 34
—29 graphic representations of FAA radar data for TWA flight 800

TWA 747 Out of JFK, July 17, 1996
FAA Radar Data From NYTRACON, NYCTR, and BOSCTR

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ♦ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- ▲ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ♦ NAVY -2.80s nvyrp43.csv
- ◊ NORAD +75.715s nrd43.csv

2030:42 CAM (sound of clunk)

2030:18 CAM1 climb thrust

2030:15 BOS CTR TWA800 climb and maintain 15,000 ft

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

3-27

TWA 747 out of JFK, 7/17/96

TWA 747 Out of JFK, July 17, 1996
FAA Radar Data From NYTRACON, NYCTR, and BOSCTR

TWA 747 Out of JFK, July 17, 1996
FAA Radar Data From NYTRACON, NYCTR, and BOSCTR

Main Wreckage East-West Location

30 knot target

P-3

East- West Distance From Islip, NY ASR-8 Radar (nautical miles)

Total Time, seconds

TWA 747 Out of JFK, July 17, 1996
Radar Data Overhead View Up To Last Secondary

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ★ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- • NAVY -2.80s nvyrp43.csv
- ◇ NORAD +75.715s nrd43.csv

Annotations:
- 2031:03 CAM (unintelligible)
- 2030:42 CAM (sound of clunk)
- 2030:18 CAM1 climb thrust
- 2030:15 BOS CTR TWA800 climb and maintain 15,000 ft
- 2029:35 CAM1 comment about trim
- 2029:15 CAM1 comment about #4 engine fuel flow indicator
- 2028:13 BOS CTR TWA800 traffic 1 o'clock 7 miles southbound 1000 ft above you he's a Beech 1900

Y-axis: MSL Altitude/100, feet (120 to 140)

X-axis: Total Time, seconds (1650 to 1900)

3 - 1

TWA 747 out of JFK, 7/17/96

Legend:
- JFK ASR -0.25s
- EWR ASR -0.25s
- ISP ASR -0.25s, 13.0 deg W mag var
- HPN ASR -0.25s
- BOS CTR -1.25s
- NY CTR -2.25s
- NORAD +75.715s nrd43.csv

X-axis: Total Time, seconds

Y-axis: North–South Distance from Islip ASR-8 Radar, nautical miles

TWA 747 out of JFK, 7/17/96

Legend (within plot):
- ▲ JFK ASR -0.25s
- ○ EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ● HPN ASR -0.25s
- ─── CVR END OF RECORDING
- ─── FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- ─── first JFK ASR primary consistent w/TWA breakup
- ─── 1st ISP ASR primary consistent w/TWA breakup
- ─── 1st HPN ASR primary consistent w/TWA breakup
- ─── FDR MSL ALT (30.03), BOS CTR Voice Time
- • NAVY -2.80s nvyrp43.csv
- ◇ NORAD +76.715s nrd43.csv

Y-axis: MSL Altitude/100, feet
X-axis: Total Time, seconds

3-7

RADAR DATA PLAN VIEW, ISLIP RADAR, TIME 2030-2032 EDT
TWA FLIGHT 800 OUT OF JFK, JULY 17, 1996

Legend:
- TWA 800, ISP ASR, 13.0 deg W mag var
- 1200, ISP ASR, 13.0 deg W mag var
- AMTRANS 493, ISP ASR, 13.0 deg W mag var
- USAIR 217, ISP ASR, 13.0 deg W mag var
- TWA 900, ISP ASR, 13.0 deg W mag var
- JEX 18, ISP ASR, 13.0 deg W mag var
- primaries, ISP ASR, 13.0 deg W mag var

AMTRANS 493

12-15 KNOT TARGETS

USAIR 217

TWA 900

INITIAL POST-ACCIDENT
PRIMARY RETURNS FROM
TWA 800 DEBRIS FALLING

TWA 800

NAVY P-3

FALSE RETURNS

30 KNOT TARGET

North-South Distance From Islip, NY ASR-8 Radar (nautical miles)

East-West Distance From Islip, NY ASR-8 Radar (nautical miles)

TWA 747 Out of JFK, July 17, 1996
Radar Data Overhead View Up To Last Secondary

PRIMARIES
SHOWN FOR TIME
20:30:00-20:50:00
and 8 < X < 28 nm
-18 < Y < 2 nm

North-South Distance From Islip, NY Radar (nautical miles)

East-West Distance From Islip, NY ASR-8 Radar (nautical miles)

4-5

TWA 747 Out of JFK, July 17, 1996
Radar Data Overhead View Up To Last Secondary

PRIMARIES
SHOWN FOR TIME
20:30:00-20:50:00
and 8 < X < 28 nm
-18 < Y < 2 nm

North-South Distance From Islip, NY Radar (nautical miles)

East-West Distance From Islip, NY ASR-8 Radar (nautical miles)

TWA 747 Out of JFK, July 17, 1996
Radar Data Overhead View Up To Last Secondary

Legend:
- TWA 800 secondaries, BOS CTR -1.25s, NTAP/LATSR91
- TWA 800 secondaries, NY CTR -2.25s, NTAP/LATSR91
- TWA 800 secondaries, JFK ASR -0.25s, 12.5 deg W mag var
- TWA 800 secondaries, EWR ASR -0.25s, 12.3 deg W mag var
- TWA 800 secondaries, ISP ASR -0.25s, 13.8 deg W mag var
- TWA 800 secondaries, HPN ASR -0.25s, 12.3 deg W mag var
- JFK ASR primaries, -0.25s, 12.5 deg W mag var
- EWR ASR primaries, -0.25s, 12.3 deg W mag var
- ISP ASR primaries, -0.25s, 13.8 deg W mag var
- HPN ASR primaries, -0.25s, 12.3 deg W mag var
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from Trevose, PA radar
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from Riverhead, NY radar
- 1200 track, ISP ASR -0.25s, 13.0 deg W mag var
- USAIR 217 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- JET EX 15 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- NY CTR primaries, -2.25s, NTAP/LATSR91
- BOS CTR primaries, -1.25s, NTAP/LATSR91
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from North Truro, MA radar
- NAVY/NORAD/SIKORSKY primaries from Trevose, PA radar
- NAVY/NORAD/SIKORSKY primaries from Riverhead, NY radar
- NAVY/NORAD/SIKORSKY primaries from North Truro, MA radar

PRIMARIES AND
NON-TWA 800 A/C
SHOWN FOR TIME
20:30:00-20:31:13
and 8 < X < 28 nm
-18 < Y < 2 nm

North-South Distance From Islip, NY Radar (nautical miles)

East-West Distance From Islip, NY ASR-8 Radar (nautical miles)

4-2

TWA 747 out of JFK, 7/17/96

Chart: East-West Distance from Islip ASR-8 Radar, nautical miles (y-axis, -35 to 25) versus Total Time, seconds (x-axis, 1100 to 1900)

Legend:
- BOS CTR -1.25s
- NY CTR -2.25s
- JFK ASR -0.25s, 12.50 deg W mag var
- EWR ISP -0.25s, 12.3 deg W mag var
- ISP ASR -0.25s, 13.0 deg W mag var
- HPN ASR -0.25s, 12.3 deg W mag var
- NORAD +75.715s nrd43.csv

3-6

TWA 747 Out of JFK, July 17, 1996
Radar Data Overhead View Up To Last Secondary

North-South Distance From Islip, NY Radar (nautical miles)

East-West Distance From Islip, NY ASR-8 Radar (nautical miles)

Legend:
- TWA 800 secondaries, BOS CTR -1.25s, NTAP/LATSN91
- TWA 800 secondaries, NY CTR -1.25s, NTAP/LATSN91
- TWA 800 secondaries, JFK ASR -0.25s, 12.5 deg W mag var
- TWA 800 secondaries, EWR ASR -0.25s, 12.3 deg W mag var
- TWA 800 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- TWA 800 secondaries, HPN ASR -0.25s, 12.3 deg W mag var
- JFK ASR primaries, -0.25s, 12.5 deg W mag var
- EWR ASR primaries, -0.25s, 12.3 deg W mag var
- ISP ASR primaries, -0.25s, 13.0 deg W mag var
- HPN ASR primaries, -0.25s, 12.3 deg W mag var
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from Trevose, PA radar
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from Riverhead, NY radar
- 1200 track, ISP ASR -0.25s, 13.0 deg W mag var
- USAIR 217 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- TWA 900 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- JET EX 18 secondaries, ISP ASR -0.25s, 13.0 deg W mag var
- NY CTR primaries, -1.25s, NTAP/LATSN91
- BOS CTR primaries, -1.25s, NTAP/LATSN91
- TWA 800 secondaries, NAVY/NORAD/SIKORSKY data from North Truro, MA radar
- NAVY/NORAD/SIKORSKY primaries from Trevose, PA radar
- NAVY/NORAD/SIKORSKY primaries from Riverhead, NY radar
- NAVY/NORAD/SIKORSKY primaries from North Truro, MA radar

PRIMARIES AND NON-TWA 800 A/C SHOWN FOR TIME 20:30:00-20:31:13 and 8 < X < 28 nm -18 < Y < 2 nm

4-1

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- — CVR END OF RECORDING
- — FDR END OF RECORDING (INCL .22s BUFFER)
- ▽ BOS CTR -1.25s
- ▲ NY CTR -2.25s
- — first JFK ASR primary consistent w/TWA breakup
- — 1st ISP ASR primary consistent w/TWA breakup
- — 1st HPN ASR primary consistent w/TWA breakup
- — FDR MSL ALT (30.03), BOS CTR Voice Time
- ✦ NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Axis labels: MSL Altitude/100, feet (vertical); Total Time, seconds (horizontal)

3~16

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ● HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- ▲ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ◇ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet
X-axis: Total Time, seconds

J-17

000061

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ✦ NAVY -2.80s nvyrp43.csv
- ◇ NORAD +75.715s nrd43.csv

X-axis: Total Time, seconds (1530 to 1580)

Y-axis: MSL Altitude/100, feet (95 to 105)

3-18

000062

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ○ EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ＊ HPN ASR -0.25s
- ── CVR END OF RECORDING
- ── FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- ── first JFK ASR primary consistent w/TWA breakup
- ── 1st ISP ASR primary consistent w/TWA breakup
- ── 1st HPN ASR primary consistent w/TWA breakup
- ── FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

X-axis: Total Time, seconds (1550 to 1600)
Y-axis: MSL Altitude/100, feet (105 to 115)

3-19

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ● HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- ▲ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ◇ NORAD +75.715s nrd43.csv

X-axis: Total Time, seconds (1600 to 1650)
Y-axis: MSL Altitude/100, feet (115 to 125)

3-20

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet (65 to 75)

X-axis: Total Time, seconds (1420 to 1470)

3-15

000065

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- — CVR END OF RECORDING
- — FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- — first JFK ASR primary consistent w/TWA breakup
- — 1st ISP ASR primary consistent w/TWA breakup
- — 1st HPN ASR primary consistent w/TWA breakup
- — FDR MSL ALT (30.03), BOS CTR Voice Time
- ● NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet (55 to 65)

X-axis: Total Time, seconds (1410 to 1460)

3 - 14

000066

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ◆ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ● NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet
X-axis: Total Time, seconds

3-13

TWA 747 out of JFK, 7/17/96

MSL Altitude/100, feet (y-axis)

Total Time, seconds (x-axis)

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ★ HPN ASR -0.25s
- ── CVR END OF RECORDING
- ── FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- ── first JFK ASR primary consistent w/TWA breakup
- ── 1st ISP ASR primary consistent w/TWA breakup
- ── 1st HPN ASR primary consistent w/TWA breakup
- ── FDR MSL ALT (30.03), BOS CTR Voice Time
- • NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ● NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

3~16

TWA 747 out of JFK, 7/17/96

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✶ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

3-8

TWA 747 out of JFK, 7/17/96

Legend:

- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ★ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- + NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

3-9

TWA 747 out of JFK, 7/17/96

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ▪ ISP ASR -0.25s, 13.0 deg W mag var
- ✦ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ✦ NAVY -2.80s nvyrp43.csv
- ○ NORAD +75.715s nrd43.csv

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

67

3-10

000072

TWA 747 out of JFK, 7/17/96

Y-axis: MSL Altitude/100, feet

X-axis: Total Time, seconds

Legend:
- ▲ JFK ASR -0.25s
- ● EWR ASR -0.25s
- ■ ISP ASR -0.25s, 13.0 deg W mag var
- ✴ HPN ASR -0.25s
- —— CVR END OF RECORDING
- —— FDR END OF RECORDING (INCL. .22s BUFFER)
- ▽ BOS CTR -1.25s
- △ NY CTR -2.25s
- —— first JFK ASR primary consistent w/TWA breakup
- —— 1st ISP ASR primary consistent w/TWA breakup
- —— 1st HPN ASR primary consistent w/TWA breakup
- —— FDR MSL ALT (30.03), BOS CTR Voice Time
- ● NAVY -2.80s nvyrp43.csv
- ◇ NORAD +75.715s nrd43.csv

2028:13 BOS CTR TWA800 traffic 1 o'clock 7 miles southbound 1000 ft above you he's a Beech 1900

Y-axis values: 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130

X-axis values: 1650, 1660, 1670, 1680, 1690, 1700

3-2

SEVEN

NTSB Record 35
— 10 graphic representations of NTSB TWA flight 800 Main Wreckage Simulation

.

TWA ^00
FDR Heading vs. Corrected Heading

TWA 870
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

TWA ℰℒℴ
Main Wreckage Simulation

TWA C00
Main Wreckage Simulation

Legend:
- ◇ Primary returns
- ☆ Islip Beacon
- ★ Main Wreckage
- → Fwd fuselage
- — Simulation

Axis labels:
- North - South Position (N-Mi)
- East West Positon (N - Mi)

Data point labels:
- 785.46087
- 780.46077
- 790.46097
- 775.46067
- 770.46057
- 765.46047
- 760.46037
- 755.46027
- 750.46017
- 745.46007
- 740.45997

TWA 800
Main Wreckage Simulation

TWA ( )0
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

TWA ()0
Main Wreckage Simulation

TWA 800
Main Wreckage Simulation

EIGHT
NTSB Record 36
—62 pages of charts of segments of radar data

- HPN ASR PRIMARIES, 12.3°W MAG VAR
- 8<X<28 NM, -18<Y<2 NM
- X/Y RELATIVE TO ISP ASR

SEN3.XYZ

HOURS	MINUTES	SECONDS	X, NM	Y, NM	SENSOR	MIN*60+SEC-0.25
0	26	9.33	12.3724	-9.6156	3	1569.08
0	26	14.02	12.4513	-9.4918	3	1573.77
0	26	14.17	11.8052	-16.741	3	1573.92
0	26	23.57	9.4129	-13.3391	3	1583.32
0	26	23.57	15.9263	-15.6319	3	1583.32
0	26	32.81	12.4994	-4.1909	3	1592.56
0	26	42.2	12.5557	-4.2192	3	1601.95
0	26	46.89	12.4717	-4.4886	3	1606.64
0	26	56.31	14.7348	-2.5217	3	1616.06
0	27	1	14.6483	-2.7179	3	1620.75
0	27	1.15	11.9108	-16.9317	3	1620.9
0	27	10.39	12.6913	-4.3657	3	1630.14
0	27	24.49	14.8202	-2.481	3	1644.24
0	27	29.19	10.3265	-2.8776	3	1648.94
0	27	47.98	12.8652	-4.6109	3	1667.73
0	28	1.92	20.882	0.6026	3	1681.67
0	28	2.21	12.2049	-16.9685	3	1681.96
0	28	6.76	13.9651	-8.0822	3	1686.51
0	28	6.91	12.154	-17.03	3	1686.66
0	28	11.31	20.9979	0.8133	3	1691.06
0	28	11.46	12.8862	-9.9443	3	1691.21
0	28	11.61	12.2412	-16.9984	3	1691.36
0	28	20.85	14.935	-2.4529	3	1700.6
0	28	25.71	12.3785	-16.9056	3	1705.46
0	28	44.35	13.2676	-4.5776	3	1724.1
0	28	48.9	21.227	0.6586	3	1728.65
0	28	49.19	12.1573	-17.345	3	1728.94
0	28	53.59	17.4795	-1.0449	3	1733.34
0	28	58.3	17.532	-0.9055	3	1738.05
0	29	3.13	10.0245	0.092	3	1742.88
0	29	7.82	15.0063	-2.5622	3	1747.57
0	29	7.68	17.5234	-1.0615	3	1747.43
0	29	7.97	13.0161	-10.2048	3	1747.72
0	29	12.37	17.5938	-1.0084	3	1752.12
0	29	31.31	10.7884	-3.1075	3	1771.06
0	29	31.46	13.9198	-14.2748	3	1771.21
0	29	40.69	10.9179	-2.9495	3	1780.44
0	29	50.25	9.5361	-13.4365	3	1790
0	29	54.8	10.8717	-3.149	3	1794.55
0	29	54.8	15.0924	-2.5998	3	1794.55
0	29	59.5	15.0924	-2.5998	3	1799.25
0	30	8.87	15.1355	-2.6185	3	1808.62
0	30	18.28	21.3861	-8.0056	3	1818.03
0	30	22.98	21.1489	-8.1702	3	1822.73
0	30	27.67	20.863	-8.4954	3	1827.42
0	30	27.52	21.8777	0.5375	3	1827.27
0	30	32.36	20.5096	-8.8793	3	1832.11
0	30	37.22	14.1501	-14.5411	3	1836.97
0	30	37.08	20.2173	-9.1027	3	1836.83
0	30	41.77	19.8836	-9.3972	3	1841.52
0	30	46.61	14.3291	-14.3747	3	1846.36
0	30	46.46	19.6049	-9.718	3	1846.21
0	30	51.15	19.2677	-10.0057	3	1850 9
0	30	55.7	18.1369	-1.2939	3	1855.45
0	30	55.7	19 7464	1.6854	3	1855.45
0	30	55.85	18.448	-11.2499	3	1855.6
0	31	0.55	18.7671	-10.4815	3	1860.3
0	31	5.25	18.4269	-10.7597	3	1865
0	31	9.94	18.0962	-11.1373	3	1869 69
0	31	14.64	17.7502	-11.5025	3	1874.39
0	31	14.64	19.594	-8.7756	3	1874.39
0	31	24.04	20.797	-7.7169	3	1883.79
0	31	24.04	17.1523	-11.9973	3	1883.79
0	31	24.04	13 6109	-10.3183	3	1883.79
0	31	24.04	19.4841	-9.1837	3	1883.79
0	31	28.75	20.9738	-7.7106	3	1888.5
0	31	28.87	16.235	-13.2455	3	1888.62
0	31	28.87	13.487	10.5981	3	1888.62
0	31	28 75	19.1684	-9.6679	3	1888.5

Page 1

0	31	28.75	19.7022	-9.2063	3	1888.5
0	31	33.44	21.1818	-7.5339	3	1893.19
0	31	33.29	18.4069	-1.1527	3	1893.04
0	31	33.44	16.6808	-12.2759	3	1893.19
0	31	33.44	19.2493	-9.6182	3	1893.19
0	31	33.44	19.6201	-9.1626	3	1893.19
0	31	33.44	20.0512	-8.6423	3	1893.19
0	31	38.13	21.2604	-7.4789	3	1897.88
0	31	38.28	16.1613	-12.9043	3	1898.03
0	31	38.13	19.3281	-9.4733	3	1897.88
0	31	38.13	19.9714	-8.6942	3	1897.88
0	31	38.13	20.1898	-8.7139	3	1897.88
0	31	42.83	20.7566	-8.2555	3	1902.58
0	31	42.83	21.1938	-7.7247	3	1902.58
0	31	42.83	21.4527	-7.2921	3	1902.58
0	31	42.68	11.0503	1.3905	3	1902.43
0	31	42.68	18.3876	-1.4702	3	1902.43
0	31	42.97	15.8914	-13.1137	3	1902.72
0	31	42.83	19.3695	-9.4957	3	1902.58
0	31	47.52	11.3036	-3.4391	3	1907.27
0	31	47.52	21.4858	-7.5872	3	1907.27
0	31	47.52	21.2664	-7.5748	3	1907.27
0	31	47.37	11.0487	1.2542	3	1907.12
0	31	47.67	15.6335	-13.3286	3	1907.42
0	31	47.52	19.6032	-9.0601	3	1907.27
0	31	52.22	20.4911	-8.1223	3	1911.97
0	31	52.22	21.23	-7.6502	3	1911.97
0	31	52.07	11.0926	1.2375	3	1911.82
0	31	52.37	9.9283	-13.7465	3	1912.12
0	31	52.37	15.3162	-13.6	3	1912.12
0	31	52.22	19.4642	-9.4531	3	1911.97
0	31	52.22	20.0435	-8.452	3	1911.97
0	31	56.77	18.3651	-1.705	3	1916.52
0	31	57.06	15.0101	-13.8762	3	1916.81
0	32	1.78	14.6422	-14.2062	3	1921.53
0	32	6.47	14.3712	-14.5041	3	1926.22
0	32	11.16	14.0935	-14.6979	3	1930.91
0	32	15.85	13.8184	-14.9905	3	1935.6
0	32	15.71	19.6995	-9.1112	3	1935.46
0	32	20.58	13.4563	-15.3163	3	1940.33
0	32	25.26	13.1764	-15.604	3	1945.01
0	32	25.26	13.0635	-12.0491	3	1945.01
0	32	25.12	19.7022	-9.2063	3	1944.87
0	32	29.95	12.8946	-15.7871	3	1949.7
0	32	34.52	19.7046	-9.3015	3	1954.27
0	32	34.67	12.5619	-16.1322	3	1954.42
0	32	39.36	12.2787	-16.3108	3	1959.11
0	32	43.77	18.7774	-1.4547	3	1963.52
0	32	44.06	12.0423	-16.5271	3	1963.81
0	32	53.44	11.3663	-17.0953	3	1973.19
0	32	58.01	8.9874	-1.2333	3	1977.76
0	32	58.16	10.7811	-17.6315	3	1977.91
0	33	2.85	10.5383	-17.8366	3	1982.6
0	33	16.93	8.0112	-7.6089	3	1996.68
0	33	30.74	19.0281	-1.6315	3	2010.49
0	33	30.89	20.2968	-9.0501	3	2010.64
0	33	40.27	9.1173	-1.4336	3	2020.02
0	33	58.93	20.2462	1.2922	3	2038.68
0	34	8.47	15.8624	-3.2561	3	2048.22
0	34	8.32	20.2462	1.2922	3	2048.07
0	34	13.17	9.3277	-1.4635	3	2052.92
0	34	31.81	19.3372	-1.8316	3	2071.56
0	34	41.34	19.6236	-10.2031	3	2081.09
0	35	4.86	16.2529	-3.1058	3	2104.61
0	35	23.8	10.6509	-14.3177	3	2123.55
0	36	10.63	11.5741	-2.5262	3	2170.38
0	36	20.03	21.4744	-6.6565	3	2179.78
0	36	24.73	21.4468	-6.8278	3	2184.48
0	36	29.42	16.6383	-3.3552	3	2189.17

0	36	34.12	16.591	-3.5792	3	2193.87
0	36	34.12	9.9555	-3.9403	3	2193.87
0	36	38.66	23.9196	1.369	3	2198.41
0	36	43.5	16.591	-3.5792	3	2203.25
0	36	48.05	19.4659	-1.2186	3	2207.8
0	36	52.91	12.493	-4.3433	3	2212.66
0	36	57.6	12.5034	-4.4266	3	2217.35
0	37	11.54	19.5172	-2.2332	3	2231.29
0	37	16.4	19.4471	-2.5413	3	2236.15
0	37	21.1	9.966	-2.1224	3	2240.85
0	37	21.1	19.4042	-2.7766	3	2240.85
0	37	53.99	12.7895	-4.4153	3	2273.74
0	37	58.68	9.9751	-0.0244	3	2278.43
0	38	12.78	10.0787	0.3425	3	2292.53
0	38	36.42	11.1344	-15.0912	3	2316.17
0	38	55.07	15.4366	-11.2037	3	2334.82
0	38	59.91	15.1708	-17.5694	3	2339.66
0	38	59.76	15.2683	-11.4685	3	2339.51
0	39	4.61	15.0151	-17.7674	3	2344.36
0	39	9.31	14.2001	-12.5468	3	2349.06
0	39	13.86	17.3333	-3.9083	3	2353.61
0	39	18.56	17.4377	-3.7882	3	2358.31
0	39	37.36	20.8707	-6.2869	3	2377.11
0	39	42.06	20.9478	-6.2316	3	2381.81
0	39	42.06	17.4759	-3.9715	3	2381.81
0	39	51.45	17.5805	-3.851	3	2391.2
0	40	5.56	10.6115	-2.6521	3	2405.31
0	40	14.94	17.6812	-3.8953	3	2414.69
0	40	29.19	8.2679	-11.1942	3	2428.94
0	40	47.85	17.8401	-3.8815	3	2447.6
0	40	47.71	21.5096	-2.2254	3	2447.46
0	40	52.54	17.9894	-3.6964	3	2452.29
0	41	1.93	17.9286	-3.8364	3	2461.68
0	41	6.78	10.0583	-14.8065	3	2466.53
0	41	11.33	17.9716	-3.8552	3	2471.08
0	41	20.74	10.7999	-3.1875	3	2480.49
0	41	20.74	18.1061	-3.6631	3	2480.49
0	41	34.83	18.0071	-4.1228	3	2494.58
0	41	39.53	12.3637	-2.9754	3	2499.28
0	41	53.62	18.0959	-4.0776	3	2513.37
0	41	58.16	20.5939	-2.3951	3	2517.91
0	41	58.45	11.2798	-13.6601	3	2518.2
0	42	2.86	20.6788	-2.1715	3	2522.61
0	42	3.15	14.5241	-12.9588	3	2522.9
0	42	17.13	11.1423	-3.0599	3	2536.88
0	42	31.21	18.3747	-3.9465	3	2550.96
0	42	31.21	13.8716	-5.2851	3	2550.96
0	42	45.31	11.164	-3.3694	3	2565.06
0	42	59.56	9.9879	-9.9317	3	2579.31
0	43	4.11	16.3634	-1.2457	3	2583.86
0	43	13.49	11.2735	-3.4992	3	2593.24
0	43	18.18	11.3456	-3.4601	3	2597.93
0	43	27.74	11.8124	-16.339	3	2607.49
0	43	36.84	20.0835	-0.3674	3	2616.59
0	43	41.55	20.3118	-0.0341	3	2621.3
0	44	10.03	17.9682	-13.995	3	2649.78
0	44	9.88	8.0402	-5.395	3	2649.63
0	44	37.93	21.8016	0.9784	3	2677.68
0	44	42.78	11.7509	-3.6626	3	2682.53
0	45	11.12	11.9268	-14.1524	3	2710.87
0	45	10.97	16.771	-12.0459	3	2710.72
0	45	10.97	10.8497	-4.9506	3	2710.72
0	45	20.36	18.9764	-4.2077	3	2720.11
0	45	24.93	21.5569	-2.6763	3	2724.68
0	45	34.46	11.9135	-3.8959	3	2734.21
0	45	34.46	16.6767	-12.3696	3	2734.21
0	45	39.32	16.6329	-12.438	3	2739.07
0	45	48.56	16.86	-12.1972	3	2748.31
0	45	57.95	8.4758	-5.7321	3	2757.7

0	46	7.5	12.2185	-14.1815	3	2767.25
0	46	12.04	8.4615	-5.8758	3	2771.79
0	46	21.29	22.5641	-2.6174	3	2781.04
0	46	30.7	21.7078	0.6744	3	2790.45
0	46	31	9.0825	-8.4813	3	2790.75
0	46	40.25	13.3177	-8.4728	3	2800
0	46	59.19	9.8216	-8.7236	3	2818.94
0	47	8.28	21.8439	0.7993	3	2828.03
0	47	13.15	19.4351	-4.4069	3	2832.9
0	47	13.29	10.0279	-8.6098	3	2833.04
0	47	32.08	8.3382	-15.8909	3	2851.83
0	47	36.63	19.536	-4.4507	3	2856.38
0	47	41.18	12.505	1.4035	3	2860.93
0	47	45.88	12.5264	1.3253	3	2865.63
0	47	46.17	8.3241	-15.9777	3	2865.92
0	48	4.68	12.555	0.8206	3	2884.43
0	48	51.82	12.7537	-4.2417	3	2931.57
0	49	1.08	11.5883	0.7004	3	2940.83
0	49	1.38	12.951	-14.6369	3	2941.13
0	49	15.33	10.323	-4.9691	3	2955.08
0	49	20.03	9.0932	-6.492	3	2959.78
0	49	34.12	9.1681	-6.4596	3	2973.87
0	49	34.12	18.3862	-10.7361	3	2973.87
0	49	38.96	10.5887	-12.3958	3	2978.71
0	49	38.96	8.9292	-16.2126	3	2978.71
0	49	57.6	9.2822	-6.451	3	2997.35
0	49	57.6	15.2566	-6.5839	3	2997.35
0	50	7.02	12.9071	-4.6322	3	3006.77
0	50	7.02	15.2982	-6.6058	3	3006.77

0

			X	Y	mile			
O	30	2.8	22.8763	-6.802	0	1802.8	1800	
O	30	14.8	22.0979	-7.2294	0	1814.8	1812	
O	30	26.8	21.2968	-8.0294	0	1826.8	1824	
O	30	38.9	20.4351	-8.6353	0	1838.9	1836.1	
	31	26.8	19.3635	-6.4748	0	1886.8	1884	
O	31	26.9	20.5141	-7.1878	0	1886.9	1884.1	
O	31	27.1	17.5714	-12.2531		0	1887.1	1884.3
O	31	38.9	20.9686	-6.141	0	1898.9	1896.1	
O	31	39.1	16.6068	-12.5168		0	1899.1	1896.3
O	31	51	20.2155	-8.3574	0	1911	1908.2	
O	32	3.1	15.2068	-14.0543		0	1923.1	1920.3
O	32	15.1	14.3214	-14.6228		0	1935.1	1932.3
O	32	15.1	20.0711	-8.7445	0	1935.1	1932.3	

RP43PRI.XY

(NVYPRI~1.XY)

TREVOSE PA.

0	30	9.5	22.3036	-7.6281	1809.5	1	1806.7	
0	30	21.7	21.4395	-8.3461	1821.7	1	1818.9	
0	30	23.4	10.8315	-3.6077	1823.4	1	1820.6	
0	30	33.7	20.6762	-9.0999	1833.7	1	1830.9	
	30	46.1	16.4155	-14.0754		1846.1	1	1843.3
0	30	57.1	26.5676	-15.29	1857.1	1	1854.3	
0	30	57.1	26.5676	-15.29	1857.1	1	1854.3	
0	30	57.8	19.0151	-10.4723		1857.8	1	1855
0	30	57.8	19.0151	-10.4723		1857.8	1	1855
0	31	11.1	11.0648	-3.4823	1871.1	1	1868.3	
0	31	21.4	-19.94	-8.6766	1881.4	1	1878.6	
0	31	23.1	10.9383	-3.5429	1883.1	1	1880.3	
0	31	33.3	-21.0271	-8.0355	1893.3	1	1890.5	
0	31	33.6	18.2005	-8.9609	1893.6	1	1890.8	
0	31	33.9	16.6567	-12.5938		1893.9	1	1891.1
0	31	35	10.9249	-3.5305	1895	1	1892.2	
0	31	45.2	-21.3427	-7.8555	1905.2	1	1902.4	
0	31	45.8	15.8915	-13.2435		1905.8	1	1903
0	31	47	10.8045	-3.5826	1907	1	1904.2	
0	31	57.1	21.5449	-7.9366	1917.1	1	1914.3	
0	31	57.8	15.0206	-13.9814		1917.8	1	1915
0	31	58.4	14.6802	-2.1207	1918.4	1	1915.6	
0	31	58.9	10.8436	-3.6188	1918.9	1	1916.1	
0	32	9	21.4861	-7.949	1929	1	1926.2	
0	32	9.8	14.2427	-14.704	1929.8	1	1927	

RP44PR1.XY

RIVERHEAD

O	30	7.4	22.31	-8.1812	1807.4	2	1804.6	
O	30	19.5	21.4854	-8.7468	1819.5	2	1816.7	
O	30	31.4	20.6895	-9.5661	1831.4	2	1828.6	
O	30	43.3	19.8658	-10.1331		1843.3	2	1840.5
	30	55.4	19.0421	-10.7001		1855.4	2	1852.6
	30	55.4	8.2851	-10.0405		1855.4	2	1852.6
O	31	7.4	18.242	-11.5304		1867.4	2	1864.6
O	31	19.4	17.4524	-12.3577		1879.4	2	1876.6
O	31	19.4	19.5944	-9.5246	1879.4	2	1876.6	
O	31	31.3	20.2485	-9.5954	1891.3	2	1888.5	
O	31	31.4	16.4976	-12.7351		1891.4	2	1888.6
O	31	43.3	15.8086	-13.4969		1903.3	2	1900.5
O	31	43.4	20.9943	-9.3563	1903.4	2	1900.6	
O	31	55.4	15.1353	-14.5081		1915.4	2	1912.6
O	31	55.4	21.3276	-9.3995	1915.4	2	1912.6	
O	31	55.5	19.5275	-8.7489	1915.5	2	1912.7	
O	32	7.4	14.5886	-15.471	1927.4	2	1924.6	

RP47PRI.XY

NEW TRUSO MM

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H    S    M    R     AZ      #
0,30,2,0,28.63,239.06,0,1
0,30,2.2,0,29.75,239.94,0,1
0,30,2.3,0,40.13,249.52,0,1
0,30,2.4,0,120.5,55.37,0,0
  30,2.4,0,12.25,252.95,0,1
0,30,2.4,0,39.75,254.44,0,1
0,30,2.8,0,114,72.77,0,0
0,30,3.1,0,105.63,82.44,0,0
0,30,7.6,0,38.88,104.85,0,1
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0,30,8.6,0,26.75,133.33,0,1
0,30,8.6,0,36.63,136.41,0,1
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0,30,10.4,0,40.38,192.22,0,1
0,30,11.1,0,29.38,210.94,0,1
0,30,11.5,0,36.38,223.59,0,1
0,30,11.5,0,20.75,222.98,0,1
0,30,13.9,0,26.75,230.63,0,1
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0,30,14,0,28.75,239.06,0,1
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0,30,14.3,0,11.88,255.5,0,1
0,30,14.3,0,39.75,254.44,0,1
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0,30,19,0,136.5,220.78,0,2
  30,19.5,0,142.38,235.55,0,2
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0,30,23,0,29.25,210.5,0,1
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0,30,23.5,0,36.5,223.51,0,1
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NVYALL1. CSV

- ch . ...
- ... ...
- ... ...
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NY_97.CSV

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.	20	38	22.7	-6.035	1238	1235.75
0	20	39	8.875	-12.643	1239	1236.75
0	20	41	8.988	-12.392	1241	1238.75
0	20	47	8.988	-12.392	1247	1244.75
0	20	49	27.074	-14.406	1249	1246.75
0	20	51	9.992	-11.64	1251	1248.75
0	20	52	11.022	-3.354	1252	1249.75
0	20	53	10.231	-11.239	1253	1250.75
0	21	3	11.022	-3.354	1263	1260.75
0	21	5	10.951	-9.987	1265	1262.75
0	21	13	26.936	-14.69	1273	1270.75
0	21	15	11.022	-3.354	1275	1272.75
0	21	17	11.278	-8.603	1277	1274.75
0	21	27	11.49	-7.202	1287	1284.75
0	21	27	10.895	-3.471	1287	1284.75
0	21	29	11.502	-7.219	1289	1286.75
0	21	37	26.81	-14.808	1297	1294.75
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0	21	38	16.067	-15.219	1298	1295.75
0	21	41	11.701	-5.718	1301	1298.75
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!	26	41	18.479	-1.658	1601	1598.75
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0	26	59	13.651	-8.412	1619	1616.75
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NYCPRI.CSV

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BOS_97.CSV

Primaries

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0	30	1	22.626	-6.551	0	1801	1799.75	
0	30	7	8.718	0.756	0	1807	1805.75	
0	30	9	22.137	-7.188	0	1809	1807.75	
	30	13	13.67	-17.212	0	1813	1811.75	
0	30	13	13.266	-10.863	0	1813	1811.75	
0	30	13	22.009	-7.322	0	1813	1811.75	
0	30	14	8.718	0.756	0	1814	1812.75	
0	30	19	13.67	-17.212	0	1819	1817.75	
0	30	19	9.982	1.659	0	1819	1817.75	
0	30	20	13.266	-10.863	0	1820	1818.75	
0	30	21	21.265	-7.943	0	1821	1819.75	
0	30	23	13.67	-17.212	0	1823	1821.75	
0	30	25	14.67	-15.975	0	1825	1823.75	
0	30	25	14.395	-10.459	0	1825	1823.75	
0	30	25	21.138	-8.06	0	1825	1823.75	
0	30	31	14.67	-15.975	0	1831	1829.75	
0	30	31	14.67	-15.975	0	1831	1829.75	
0	30	31	20.632	-8.313	0	1831	1829.75	
0	30	31	20.632	-8.313	0	1831	1829.75	
0	30	33	20.519	-8.697	0	1833	1831.75	
0	30	37	15.396	-9.971	0	1837	1835.75	
0	30	37	20.393	-8.831	0	1837	1835.75	
0	30	45	26.416	-15.061	0	1845	1843.75	
0	30	45	19.762	-9.335	0	1845	1843.75	
0	30	46	16.278	-13.968	0	1846	1844.75	
0	30	49	16.513	-9.717	0	1849	1847.75	
0	30	49	19.636	-9.568	0	1849	1847.75	
0	30	51	19.636	-9.568	0	1851	1849.75	
0	30	55	17.164	-13.331	0	1855	1853.75	
0	30	55	19.636	-9.568	0	1855	1853.75	
0	30	57	26.405	-15.194	0	1857	1855.75	
0	30	58	18.901	-10.089	0	1858	1856.75	
0	31	1	17.147	-12.464	0	1861	1859.75	
0	31	1	18.762	-10.189	0	1861	1859.75	
0	31	1	17.767	-9.211	0	1861	1859.75	
0	31	1	8.893	-9.126	0	1861	1859.75	
0	31	6	18.762	-10.189	0	1866	1864.75	
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0	31	13	10.251	-8.739	0	1873	1871.75	
0	31	18	18.144	-10.943	0	1878	1876.75	
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0	31	19	10.251	-8.739	0	1879	1877.75	
0	31	19	17.462	1.787	0	1879	1877.75	
0	31	21	19.896	-8.567	0	1881	1879.75	
0	31	22	17.384	-11.58	0	1882	1880.75	
0	31	25	17.398	-11.696	0	1885	1883.75	
0	31	25	17.884	-9.594	0	1885	1883.75	
0	31	25	11.505	-8.219	0	1885	1883.75	
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0	31	28	17.398	-11.696	0	1888	1886.75	
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0	31	33	17.398	-11.696	0	1893	1891.75
0	31	33	18.144	-8.443	0	1893	1891.75
0	31	33	20.882	-7.829	0	1893	1891.75
	31	37	18.131	-8.326	0	1897	1895.75
0	31	37	12.875	-7.848	0	1897	1895.75
0	31	39	12.875	-7.848	0	1899	1897.75
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0	31	43	22.014	-8.072	0	1903	1901.75
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0	31	46	15.764	-12.854	0	1906	1904.75
0	31	49	15.777	-12.954	0	1909	1907.75
0	31	49	14.256	-7.359	0	1909	1907.75
0	31	49	18.379	-6.941	0	1909	1907.75
0	31	51	18.379	-6.941	0	1911	1909.75
0	31	52	18.379	-6.941	0	1912	1910.75
0	31	54	22.014	-8.072	0	1914	1912.75
0	31	55	15.777	-12.954	0	1915	1913.75
0	31	55	23.13	-7.699	0	1915	1913.75
0	31	55	14.256	-7.359	0	1915	1913.75
0	31	55	18.379	-6.941	0	1915	1913.75
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0	31	57	21.378	-7.809	0	1917	1915.75
0	31	58	14.904	-13.707	0	1918	1916.75
0	31	58	14.904	-13.707	0	1918	1916.75
0	32	1	15.499	-7.088	0	1921	1919.75
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0	32	10	14.144	-14.36	0	1930	1928.75
0	32	13	14.016	-14.46	0	1933	1931.75
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0	32	19	19.377	-3.453	0	1939	1937.75
0	32	19	19.377	-3.453	0	1939	1937.75
0	32	21	21.378	-7.809	0	1941	1939.75
0	32	22	13.408	-15.096	0	1942	1940.75
0	32	33	21.519	-7.808	0	1953	1951.75
0	32	33	21.519	-7.808	0	1953	1951.75
0	32	45	21.519	-7.808	0	1965	1963.75
0	32	56	21.505	-7.708	0	1976	1974.75
0	32	57	11.037	-17.22	0	1977	1975.75
0	33	8	21.644	-7.824	0	1988	1986.75
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0	33	20	21.773	-7.957	0	2000	1998.75
0	33	21	19.646	-9.202	0	2001	1999.75
0	33	32	21.773	-7.957	0	2012	2010.75
0	33	33	15.531	-17.838	0	2013	2011.75

0	33	34	21.773	-7.957	0	2014	2012.75
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0	34	20	18.893	-13.472	0	2060	2058.75
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0	35	8	22.144	-8.438	0	2108	2106.75
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0	35	31	24.381	-7.174	0	2131	2129.75
0	35	43	22.27	-8.57	0	2143	2141.75
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0	35	55	22.268	-8.204	0	2155	2153.75
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0	36	31	21.627	-9.324	0	2191	2189.75
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0	36	55	21.767	-9.324	0	2215	2213.75
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0	37	55	23.006	-8.433	0	2275	2273.75
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0	38	7	22.77	-9.067	0	2287	2285.75
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0,25,42.665,2633,31.75,231.68,120,1,1542.665,1618.38,121,121.5,120.5
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0,26,18.385,2633,28.625,227.55,123,1,1578.385,1654.1,124,124.5,123.5
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0,26,25.03,2633,165.125,238.45,123,2,1585.03,1660.745,124,124.5,123.5
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0,26,32.065,2633,89.375,72.77,124,0,1592.065,1667.78,125,125.5,124.5
0,26,37.07,2633,164.125,238.45,124,2,1597.07,1672.785,125,125.5,124.5
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0,26,44.1,2633,90.5,72.95,125,0,1604.1,1679.815,126,126.5,125.5
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0,27,32.2,2633,95.625,73.12,129,0,1652.2,1727.915,130,130.5,129.5
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0,27,41.365,2633,22.25,214.19,130,1,1661.365,1737.08,131,131.5,130.5
0,27,44.165,2633,96.875,73.48,129,0,1664.165,1739.88,130,130.5,129.5
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0,27,53.2,2633,21.25,212.08,128,1,1673.2,1748.915,129,129.5,128.5
0,27,56.105,2633,98.125,73.39,128,0,1676.105,1751.82,129,129.5,128.5
0,28,1.015,2633,156.125,236.87,129,2,1681.015,1756.73,130,130.5,129.5
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0,28,8.27,2633,99.375,73.48,128,0,1688.27,1763.985,129,129.5,128.5
0,28,12.84,2633,154.875,236.95,127,2,1692.84,1768.555,128,128.5,127.5
0,28,16.875,2633,19.375,207.51,127,1,1696.875,1772.59,128,128.5,127.5
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0,28,24.8,2633,153.75,236.6,127,2,1704.8,1780.515,128,128.5,127.5
0,28,28.715,2633,18.625,204.96,127,1,1708.715,1784.43,128,128.5,127.5
0,28,32.15,2633,101.75,73.39,127,0,1712.15,1787.865,128,128.5,127.5
0,28,36.85,2633,152.5,236.43,127,2,1716.85,1792.565,128,128.5,127.5
0,28,40.555,2633,17.75,202.06,128,1,1720.555,1796.27,129,129.5,128.5
0,28,44.2,2633,103,73.3,128,0,1724.2,1799.915,129,129.5,128.5
0,28,49.005,2633,151.375,236.51,129,2,1729.005,1804.72,130,130.5,129.5
0,28,52.4,2633,17,198.98,128,1,1732.4,1808.115,129,129.5,128.5
0,28,56.24,2633,104.25,73.3,128,0,1736.24,1811.955,129,129.5,128.5
0,29,0.94,2633,150.25,236.25,128,2,1740.94,1816.655,129,129.5,128.5
0,29,4.24,2633,16.25,195.64,128,1,1744.24,1819.955,129,129.5,128.5
0,29,8.19,2633,105.5,73.21,129,0,1748.19,1823.905,130,130.5,129.5
0,29,13.005,2633,149,123.25,129,2,1753.005,1828.72,130,130.5,129.5
0,29,16.075,2633,15.625,192.66,130,1,1756.075,1831.79,131,131.5,130.5
0,29,20.25,2633,106.625,73.3,130,0,1760.25,1835.965,131,131.5,130.5
0,29,24.28,2633,147.875,235.99,131,2,1764.28,1839.995,132,132.5,131.5
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1/2n o o

o = Transm...
1 = RWP...
2 = NT...

a lo h j...
3 3o

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0,25,43.97,-5.2905,-14.7327,120,1543.97,1619.685,121,121.5,120.5
0,25,56,-4.1799,-14.9272,121,1556,1631.715,122,122.5,121.5
0,26,8.06,-3.1064,-14.5908,121,1568.06,1643.775,122,122.5,121.5
0,26,20.02,-1.7949,-14.5988,123,1580.02,1655.735,124,124.5,123.5
  26,32.06,-0.6419,-14.0963,124,1592.06,1667.775,125,125.5,124.5
0,26,44.1,0.5164,-14.0348,125,1604.1,1679.815,126,126.5,125.5
0,26,56.17,2.0353,-14.3069,126,1616.17,1691.885,127,127.5,126.5
0,27,8.1,3.3117,-14.2145,127,1628.1,1703.815,128,128.5,127.5
0,27,20.16,4.5941,-14.1452,128,1640.16,1715.875,129,129.5,128.5
0,27,32.2,5.499,-12.8035,129,1652.2,1727.915,130,130.5,129.5
0,27,44.17,6.87,-13.0235,129,1664.17,1739.885,130,130.5,129.5
0,27,56.1,8.0245,-12.5203,128,1676.1,1751.815,129,129.5,128.5
0,28,8.27,9.2668,-12.3126,128,1688.27,1763.985,129,129.5,128.5
0,28,20.22,10.1639,-11.3879,127,1700.22,1775.935,128,128.5,127.5
0,28,32.15,11.4982,-11.4841,127,1712.15,1787.865,128,128.5,127.5
0,28,44.2,12.6497,-10.9718,128,1724.2,1799.915,129,129.5,128.5
0,28,56.24,13.847,-10.6126,128,1736.24,1811.955,129,129.5,128.5
0,29,8.19,14.9965,-10.0947,129,1748.19,1823.905,130,130.5,129.5
0,29,20.25,16.1218,-9.9301,130,1760.25,1835.965,131,131.5,130.5
0,29,32.19,17.2703,-9.4086,132,1772.19,1847.905,133,133.5,132.5
0,29,44.26,18.4925,-8.7012,134,1784.26,1859.975,135,135.5,134.5
0,29,56.28,19.7331,-8.4842,137,1796.28,1871.995,138,138.5,137.5
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NRD 43. CSV

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0,25,42.67,-6.1087,-14.6608,120,1542.67,1618.385,121,121.5,120.5
0,25,54.71,-4.747,-14.358,121,1554.71,1630.425,122,122.5,121.5
0,26,6.55,-3.6317,-14.3238,121,1566.55,1642.265,122,122.5,121.5
0,26,18.39,-2.3204,-14.2944,123,1578.39,1654.105,124,124.5,123.5
  26,30.23,-1.2077,-14.202,124,1590.23,1665.945,125,125.5,124.5
0,26,42.06,0.1485,-14.1482,125,1602.06,1677.775,126,126.5,125.5
0,26,53.9,1.3668,-14.0938,126,1613.9,1689.615,127,127.5,126.5
0,27,5.74,2.618,-14.0295,127,1625.74,1701.455,128,128.5,127.5
0,27,17.58,3.9018,-13.9485,128,1637.58,1713.295,129,129.5,128.5
0,27,29.52,5.0957,-13.755,129,1649.52,1725.235,130,130.5,129.5
0,27,41.37,6.2979,-13.3788,130,1661.37,1737.085,131,131.5,130.5
0,27,53.2,7.5151,-12.9793,128,1673.2,1748.915,129,129.5,128.5
0,28,5.05,8.6228,-12.6246,128,1685.05,1760.765,129,129.5,128.5
0,28,16.88,9.8517,-12.1583,127,1696.88,1772.595,128,128.5,127.5
0,28,28.72,10.9416,-11.8595,127,1708.72,1784.435,128,128.5,127.5
0,28,40.56,12.1345,-11.4246,128,1720.56,1796.275,129,129.5,128.5
0,28,52.4,13.272,-11.0498,128,1732.4,1808.115,129,129.5,128.5
0,29,4.24,14.4202,-10.6223,128,1744.24,1819.955,129,129.5,128.5
0,29,16.08,15.3766,-10.2191,130,1756.08,1831.795,131,131.5,130.5
0,29,27.81,16.5811,-9.9352,132,1767.81,1843.525,133,133.5,132.5
0,29,51.37,18.9958,-9.0977,136,1791.37,1867.085,137,137.5,136.5
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NRD44.CSV

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0,26,1.25,-4.5561,-13.4944,121,1561.25,1636.965,122,122.5,121.5
0.26,13.07,-3.0378,-14.0728,122,1573.07,1648.785,123,123.5,122.5
.6,25.03,-1.8216,-13.9048,123,1585.03,1660.745,124,124.5,123.5
0,26,37.07,-0.9694,-13.3816,124,1597.07,1672.785,125,125.5,124.5
0,26,49.12,0.6483,-13.8571,126,1609.12,1684.835,127,127.5,126.5
0,27,1.17,2.0082,-13.9072,127,1621.17,1696.885,128,128.5,127.5
0,27,13.13,3.3809,-14.2029,127,1633.13,1708.845,128,128.5,127.5
0,27,25.17,4.5691,-13.7403,128,1645.17,1720.885,129,129.5,128.5
0,27,37.1,5.7705,-13.5279,130,1657.1,1732.815,131,131.5,130.5
0,27,49.06,6.9546,-13.0568,129,1669.06,1744.775,130,130.5,129.5
0,28,1.01,8.1511,-12.8331,129,1681.01,1756.725,130,130.5,129.5
0,28,12.84,9.0798,-11.9687,127,1692.84,1768.555,128,128.5,127.5
0,28,24.8,10.5374,-12.1408,127,1704.8,1780.515,128,128.5,127.5
0,28,36.85,11.8306,-11.8301,127,1716.85,1792.565,128,128.5,127.5
0,28,49.01,12.6512,-11.0319,129,1729.01,1804.725,130,130.5,129.5
0,29,0.94,13.967,-10.9788,128,1740.94,1816.655,129,129.5,128.5
0,29,24.28,16.3157,-10.2164,131,1764.28,1839.995,132,132.5,131.5
0,29,36.9,17.7398,-10.0891,132,1776.9,1852.615,133,133.5,132.5
0,29,48.72,18.6442,-9.1963,135,1788.72,1864.435,136,136.5,135.5
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NRD47.CSV