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Technical Analysis Briefing



TWVA Flight 800

PREPARED FOR

Assistant Director, FBI
Special Agent, FBI
Special Agent, FBI



March 1997

(b)(6)



“Terrorist implications...”



If the TWA Flight 800 disaster was foreign terrorism, it would be one of the most horrific foreign terrorist acts ever committed against the U.S.

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“Most expensive air disaster investigation...”



“Flight 800 is already the most complex and expensive air disaster investigation in American history...and officials are hoping to keep it from becoming one of the greatest unsolved tragedies.”

--- CBS's "60 Minutes" (21 December 1996)

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Most Expensive "Criminal Investigation" in History



- Federal Bureau of Investigation
- Central Intelligence Agency
- National Security Agency
- Defense Intelligence Agency
 - Missile and Space Intelligence Center
- Federal Aviation Administration
- National Transportation Safety Board
- U.S. Navy
- National Labs (Sandia, Brookhaven, Lawrence Livermore)

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Was a Missile Used to Shoot Down TWA Flight 800?



Almost certainly not.

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Why This Conclusion?



*There is no evidence that any
“missile” sighting occurred
before Flight 800 exploded.*

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Eyewitnesses



Many witnesses describe seeing “flare”
or “firework” ascend toward plane
just before explosion...

What did they see?

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Answer



*Only the plane in various
stages of destruction.*

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Data Sources



- Cockpit Voice Recorder (CVR)
 - Flight Data Recorder (FDR)
 - Infrared data (one sample)
 - Locations of major debris on ocean floor
- Radar data
 - Eyewitness accounts
 - Sight
 - Sound

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Data Deficiencies



- Power off just after initial explosion:
 - Cockpit Voice Recorder (CVR)
 - Flight Data Recorder (FDR)
 - Aircraft Radar Transponder (altitude data)

- JFK Airport Radar limitations:
 - Provides only latitude and longitude
 - Samples only every 12 seconds

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Analytical Approach



- Determine precise latitude, longitude, altitude, speed and heading of TWA 800 when onboard voice and data recordings ended.
- Precisely locate each witness using GPS and/or mapping software.
- For as many witnesses as possible, determine precise azimuth of “flare/firework” sightings and “fireball” sightings.
- Determine what each witness heard ... and when (with respect to visual observations).
- Determine how long sound takes to travel from TWA 800 to each witness.
- Combine results, along with infrared data and radar tracking (transponded and “skin tracking”), to determine what the witnesses most likely saw and heard.

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TWA 800 Conditions When Onboard Voice and Data Recordings Ended



- Time recordings ended: 831:07.496 PM.
- Lat/Long = 40° 38' 45" north; 72° 41' 12" west;
= 40° 38.76' north; 72° 41.22' west;
= 40.646° north/72.687° west.
- Altitude = 13,820 ft.
- Ground Speed = 380 knots (= 641 ft/sec = MACH 0.60).
- Air Speed = 330 knots (= 557 ft/sec = MACH 0.52).
- Heading = 70.93 degrees.
- Other Fact: Average speed of sound from plane at 13,820 ft. altitude (1,062 ft/sec) to observers on ground or water (1,116 ft/sec) = 1,089 ft/sec.

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TWA 800: Lighting Conditions When Recordings End



TWA800
Sun Rise/Set
05:35/20:19
Sun Az/EI
301.03 -2.83
Sun Lat/Long
21.01N 173.78E



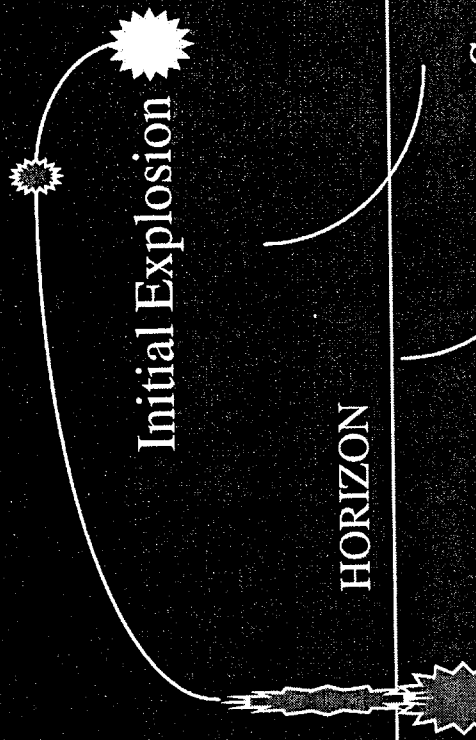
1996 Jul 17 Wed 20:31:04 EDT

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How Long From Initial Explosion to Water Impact?



Answer: Slightly Less Than 49 Seconds



Sound takes 48.6 sec to travel 52,250 ft. from aircraft to witness (corrected for "winds aloft").

Witness "V.S."

- Saw "huge, intense, orange, yellow and red fireball, that looked pear-shaped, drop from the sky into the ocean."
- "Two large... booms reached the condo and shook the ground [just]... after the fireball reached the surface of the water."

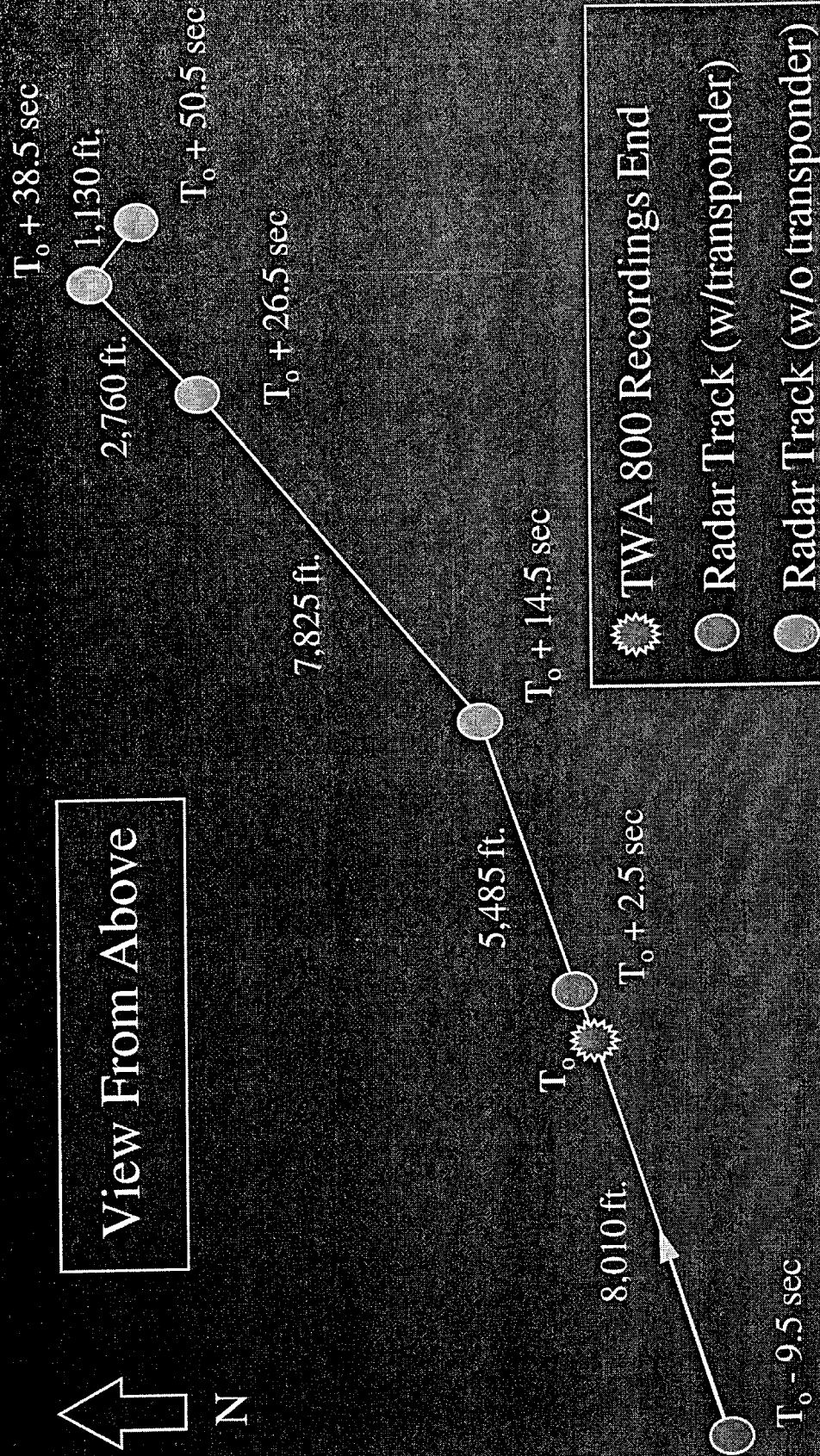
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TWA Flight 800 Radar Tracking



View From Above

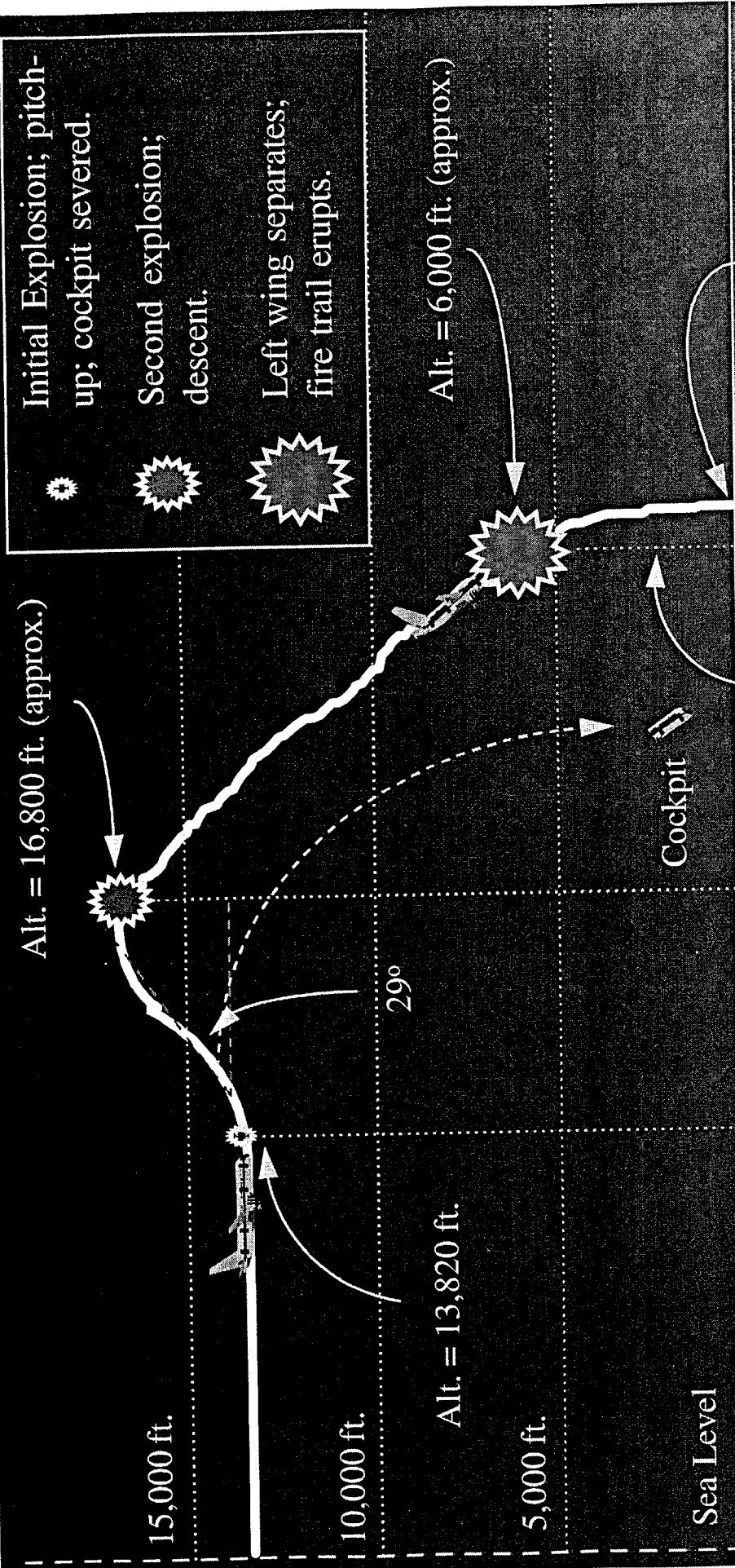


-  TWA 800 Recordings End
-  Radar Track (w/transponder)
-  Radar Track (w/o transponder)

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Estimated Flight Profile After First Explosion



Initial Explosion; pitch-up; cockpit severed.

Second explosion; descent.

Left wing separates; fire trail erupts.

$T_0 + 51$ sec (approx.)
 $D = 17,330$ ft.

$T_0 + 42$ sec
 $D = 16,955$ ft.

$T_0 + 15$ sec
 $D = 7,385$ ft.

T_0
 $D = 0$

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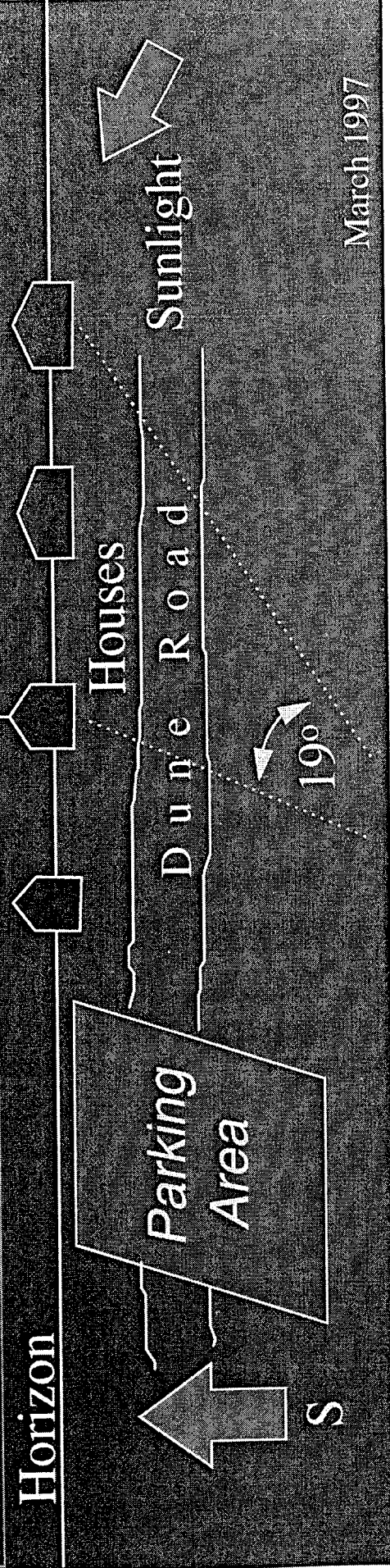
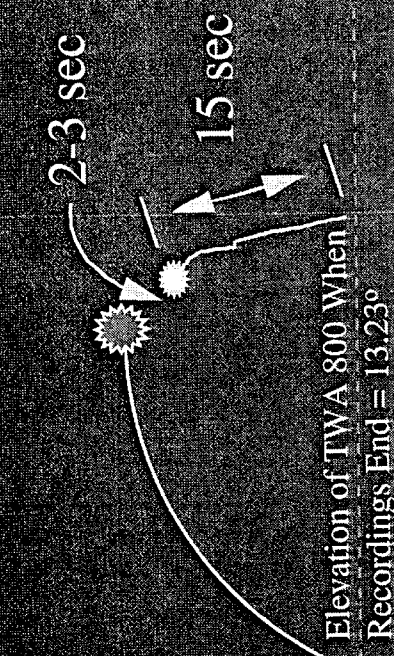


Perspective of Witness "M.W."



- House over which "zig-zagging, sparkling white light" originated was at azimuth of 196.1° - 199.1° (GPS, compass).
- TWA 800 at the instant its onboard recordings ended was at an azimuth of 196.23° (GPS, radar tracking).
- TWA 800 traveled 15.6° to witness's left in next 50.5 sec (radar tracking), consistent with witness observation.
- Sound propagation analysis indicates that sound from aircraft's first explosion would reach witness about 5 sec after aircraft hit water, consistent with witness's visual observation.
- So "sparkling white light" probably came from the aircraft AFTER ITS FIRST EXPLOSION.
- Sound propagation analysis indicates that a SECOND EXPLOSION occurred about 15 sec after the first one, consistent with witness's visual observation.

NOT TO SCALE

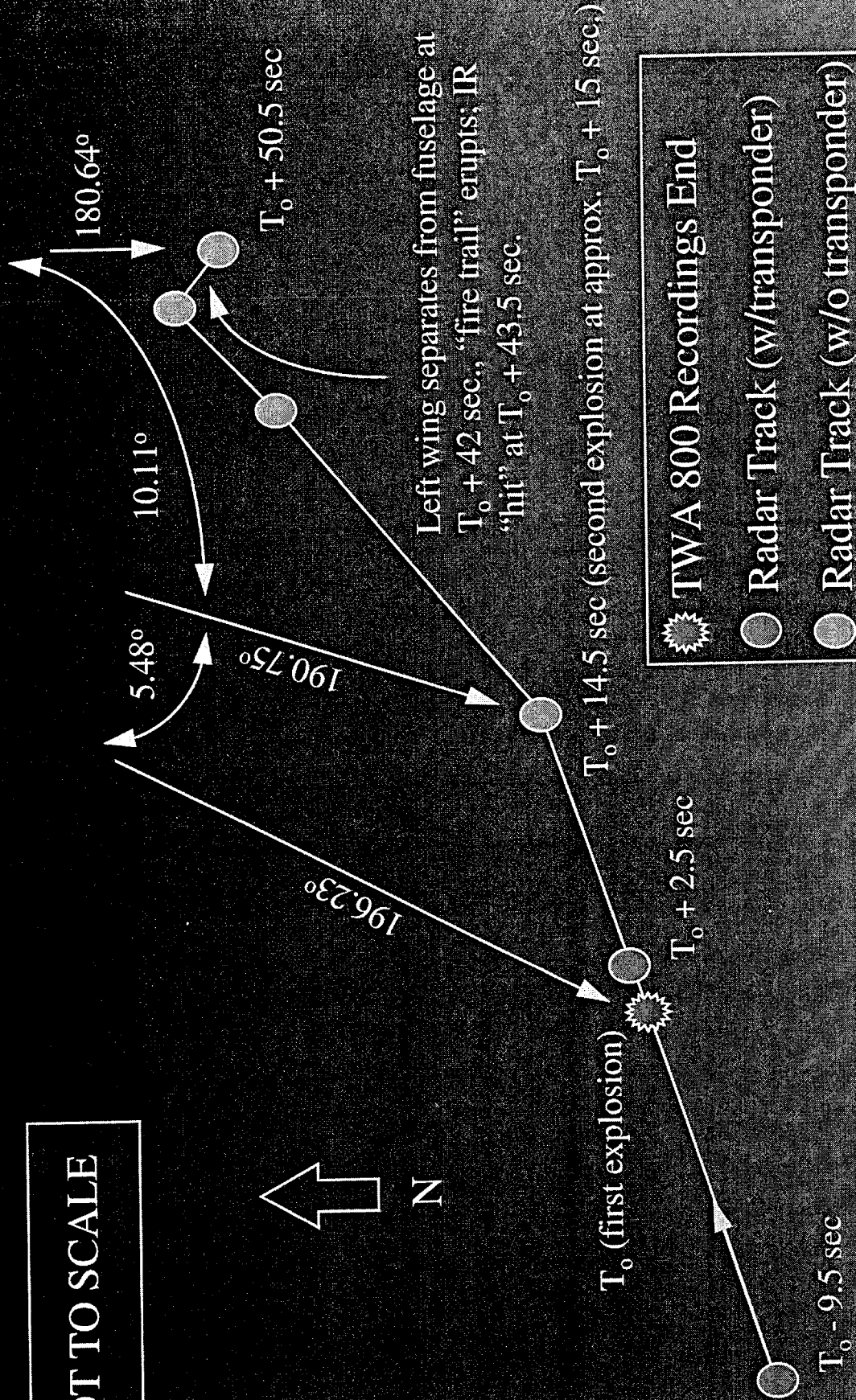


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TWA Flight 800 Radar Tracking (Azimuths to Witness "M.W.")



NOT TO SCALE



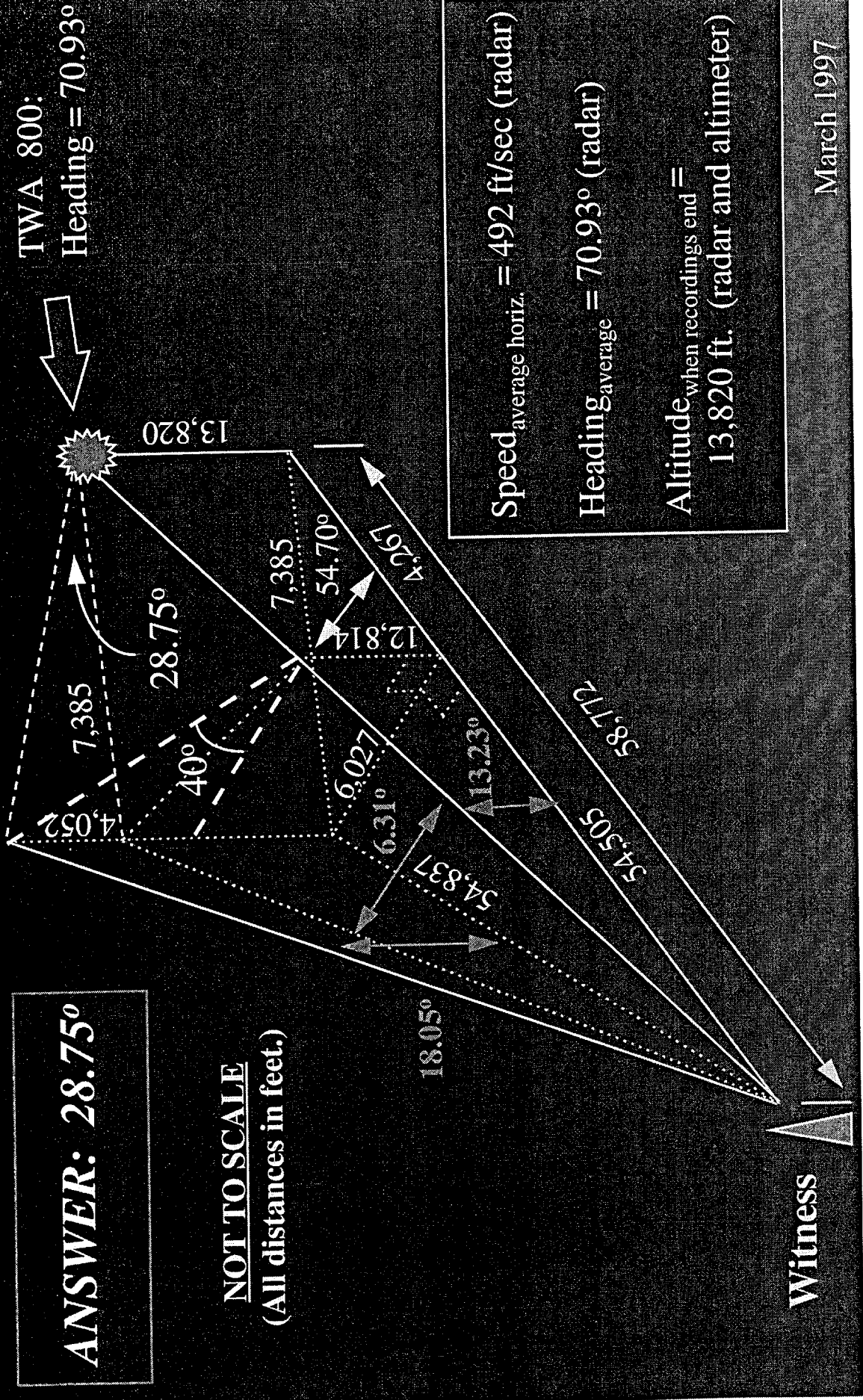
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Witness "M.W." Perspective: At What Climb Angle After Recordings End Would TWA 800 Mimic "40° Ascending Firework For 15 Seconds" ?



ANSWER: 28.75°

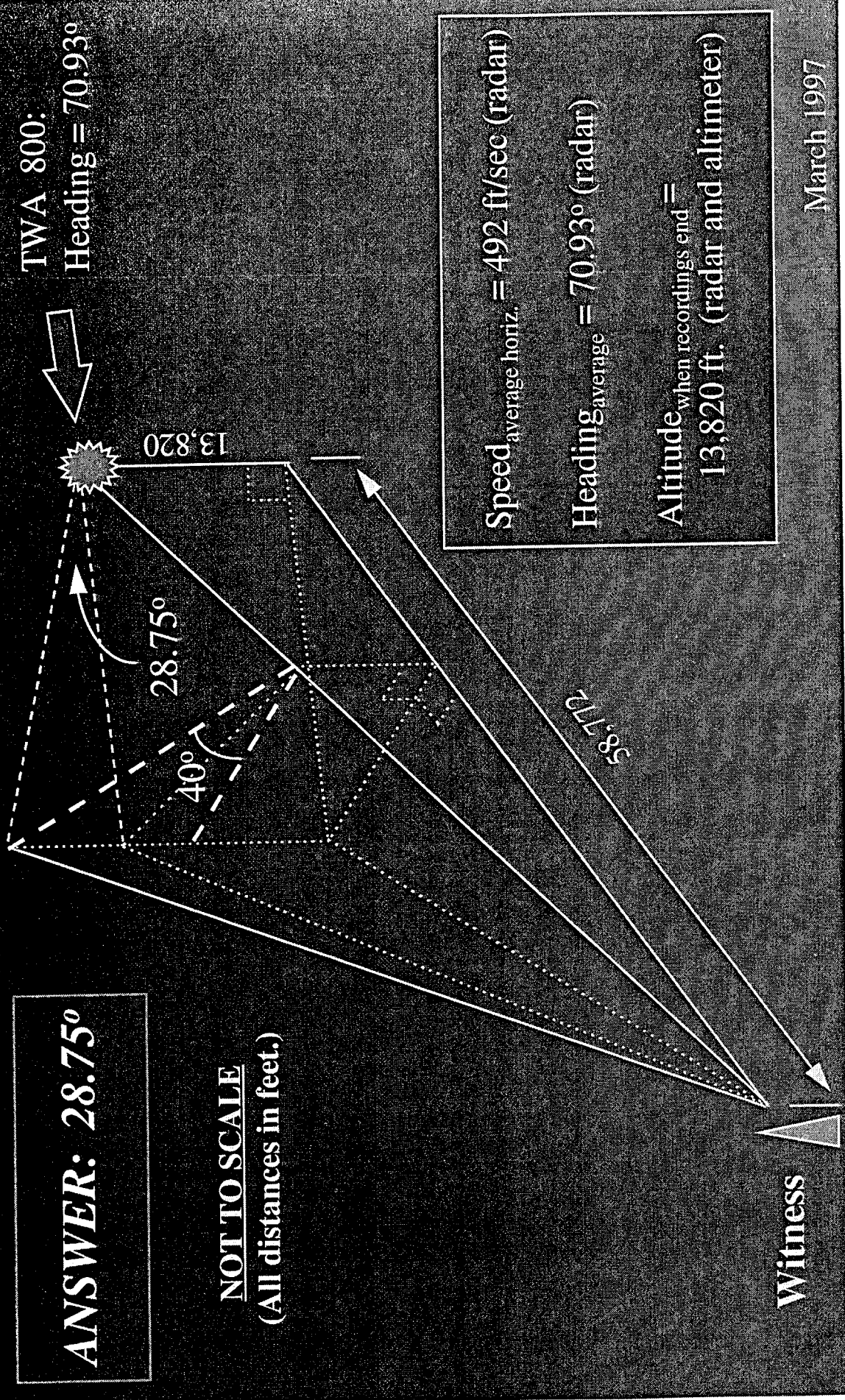
NOT TO SCALE
(All distances in feet.)



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Witness "M.W." Perspective: At What Climb Angle After Recordings End Would TWA 800 Mimic "40° Ascending Firework For 15 Seconds" ?



ANSWER: 28.75°

NOT TO SCALE
(All distances in feet.)

Speed_{average horiz.} = 492 ft/sec (radar)
 Heading_{average} = 70.93° (radar)
 Altitude_{when recordings end} =
 13,820 ft. (radar and altimeter)

Witness

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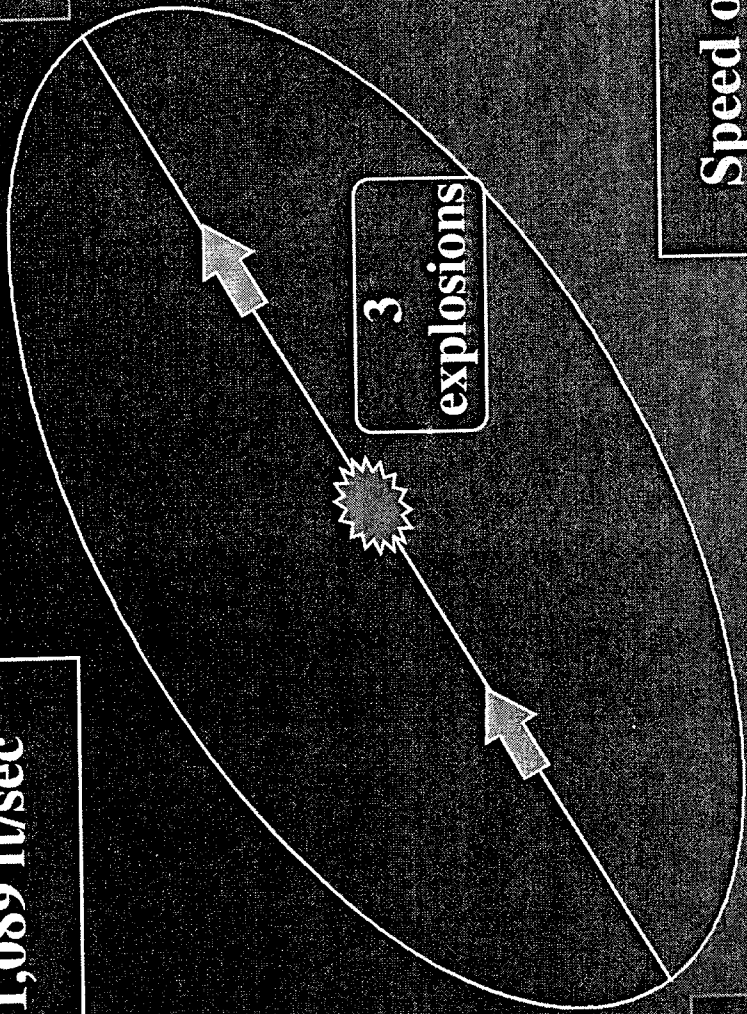


TWA 800 Sound Propagation Analysis



Sounds 10 sec
apart appear
4.1 sec apart

Average speed of sound to
observers = 1,089 ft/sec



Speed of TWA 800
= 641 ft/sec

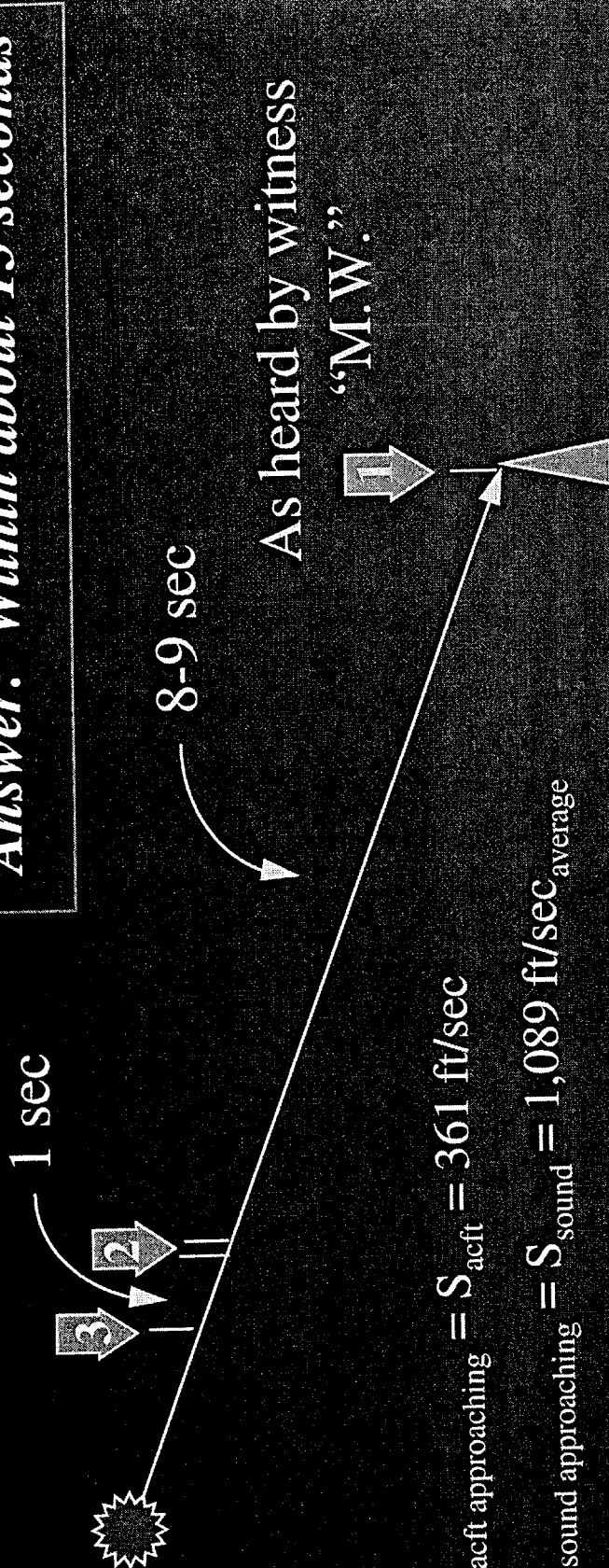
Sounds 10 sec
apart appear 15.9
sec apart

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When Did "Three Explosions" on Plane Occur?



Answer: Within about 15 seconds



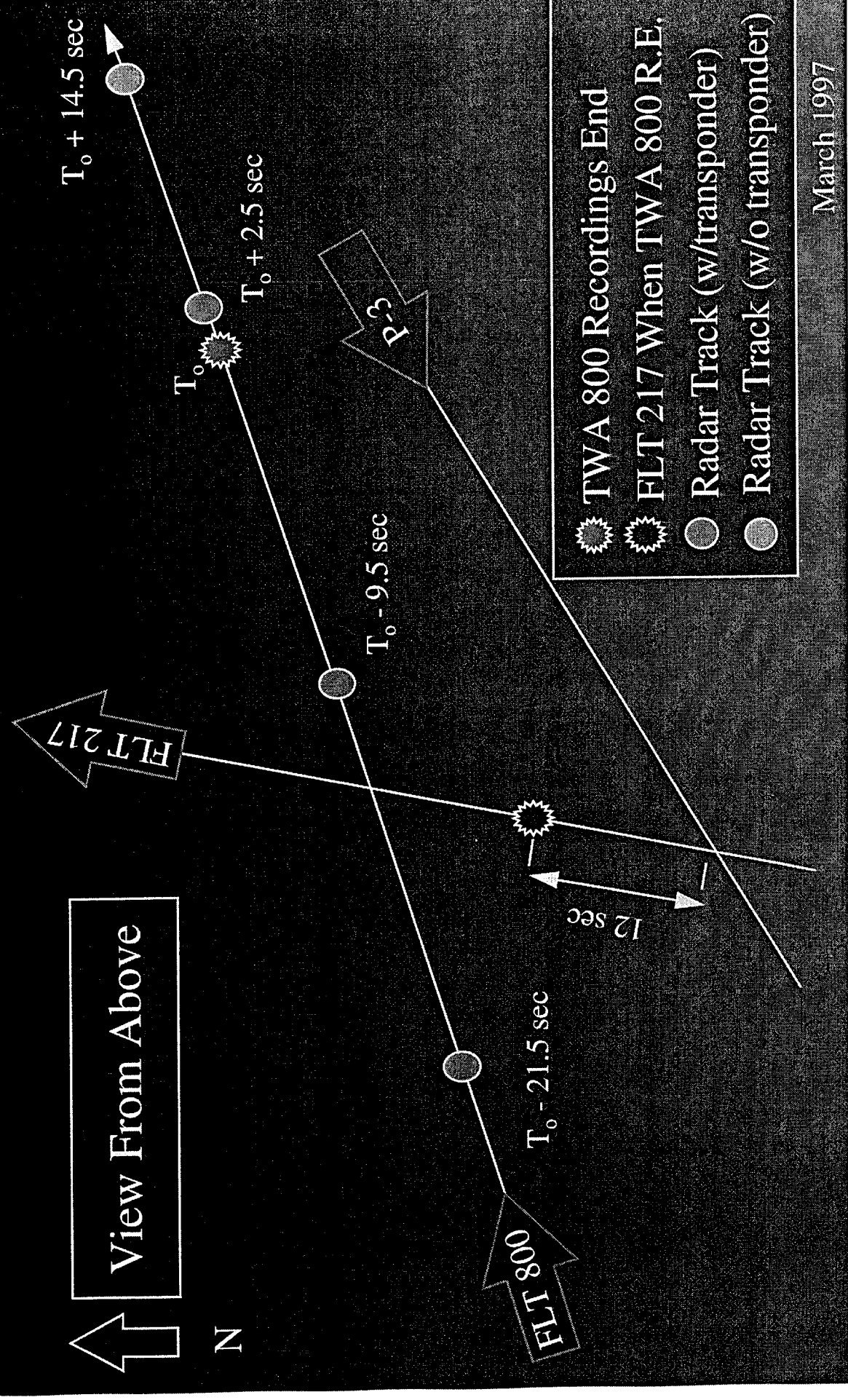
- Speed_{acft approaching} = $S_{acft} = 361 \text{ ft/sec}$
- Speed_{sound approaching} = $S_{sound} = 1,089 \text{ ft/sec}_{average}$
- Time_{between sounds on acft} = $[S_{sound} / (S_{sound} - S_{acft})] \times$
 Time_{between sounds heard on ground} = $(1,089 \text{ ft/sec}) / [(1,089 \text{ ft/sec}) - (361 \text{ ft/sec})] \times 10 \text{ sec}$
 = 15.0 sec

• So sounds heard by witness "M.W." 10 seconds apart were produced on plane 15 seconds apart.

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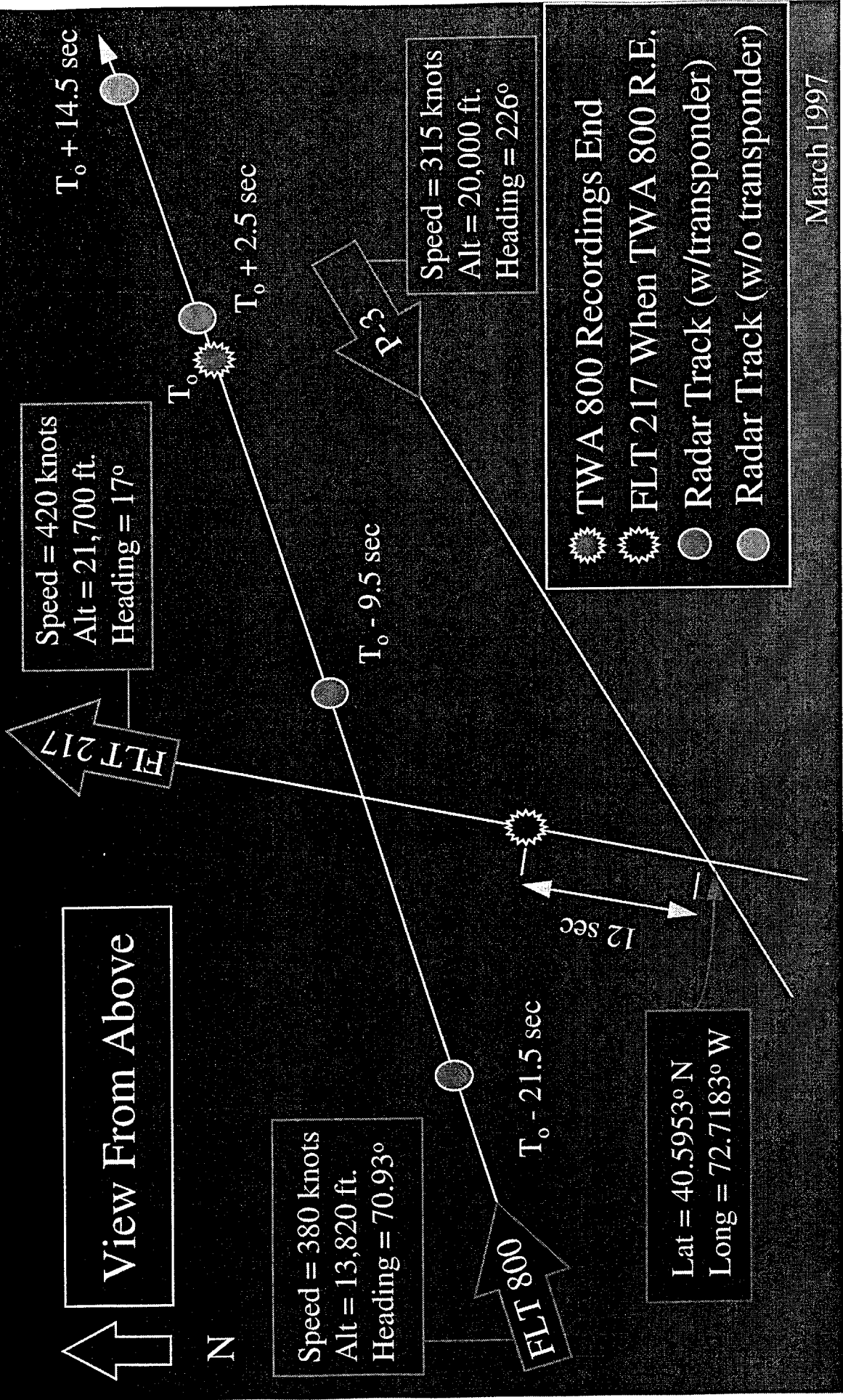
TWA Flight 800 Witnessed By "D.B." On US Air Flight 217



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TWA Flight 800 Witnessed By "D.B." On US Air Flight 217





TWA 800 Timeline



Initial
Explosion
($T_0 = 0831:07.496$ PM)



$T_0 + 15$ sec

Onboard flight data and voice recordings end at $T_0 = 0$; cockpit separates within 4 sec (last transponder radar signal received at 0831:12.133 PM); aircraft pitches up dramatically.

Two or 3 secondary explosions occur over a 2-sec period beginning at about $T_0 + 15$ sec (witness and sound propagation analysis).

While at altitude of about one mile, aircraft hooks to left and downward; left wing separates from fuselage at $T_0 + 42$ sec (witness and sound propagation analysis); "fire trail" erupts. (Infrared "hit" at $T_0 + 43.5$ sec, detects heat of "fire trail.")

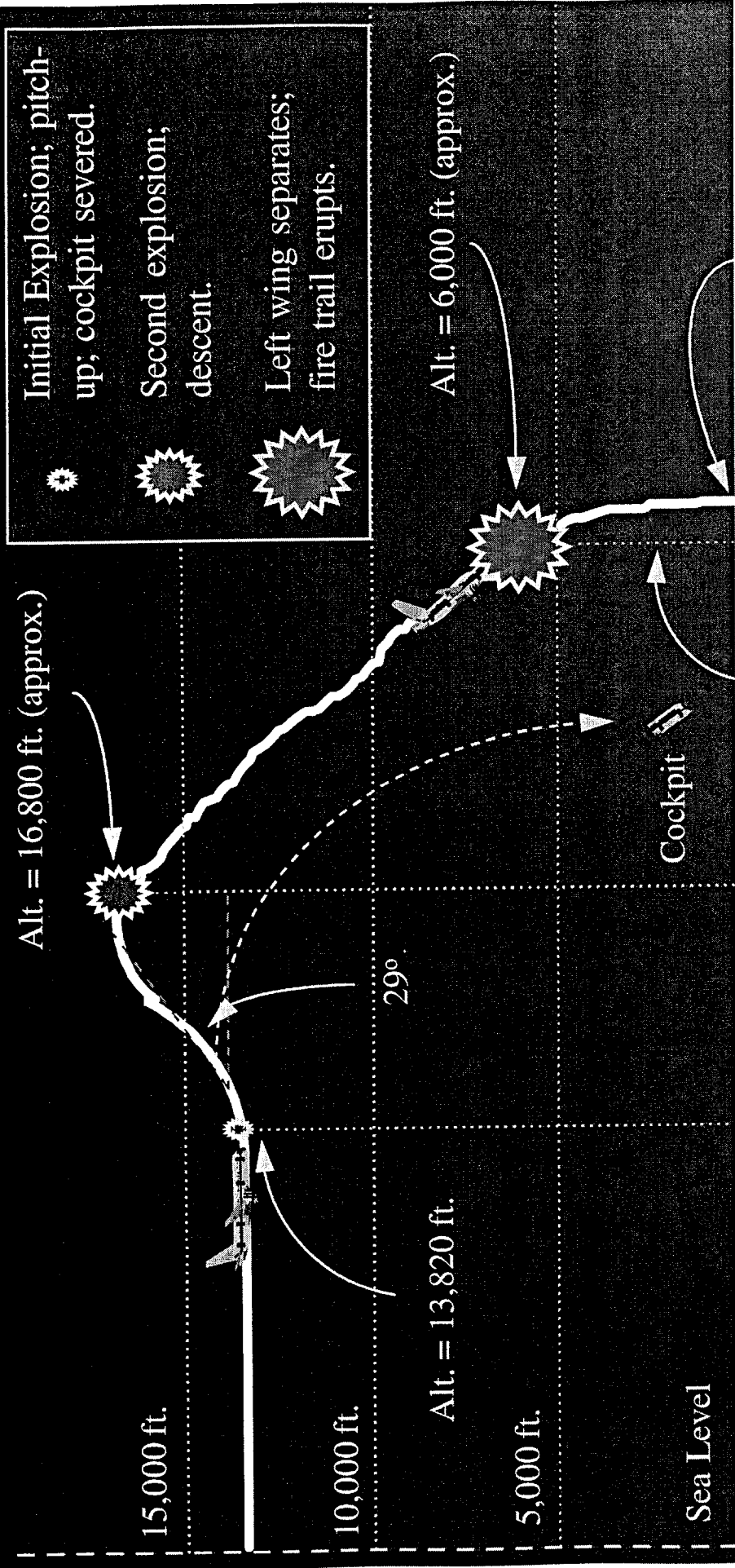
$T_0 + 42$ sec

Left wing and most of rest of plane impact water; wing trails rest of plane by 1-2 sec (witness and radar "skin track" [0831:58 PM]).

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Estimated Flight Profile After First Explosion



Initial Explosion; pitch-up; cockpit severed.

Second explosion; descent.

Left wing separates; fire trail erupts.

T_0
 $D=0$

$T_0 + 15$ sec
 $D=7,385$ ft.

$T_0 + 42$ sec
 $D=16,955$ ft.

$T_0 + 51$ sec (approx.)
 $D=17,330$ ft.

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TWA Flight 800 Eyewitnesses Summary



How do the eyewitness accounts
match the proposed trajectory
of TWA Flight 800?

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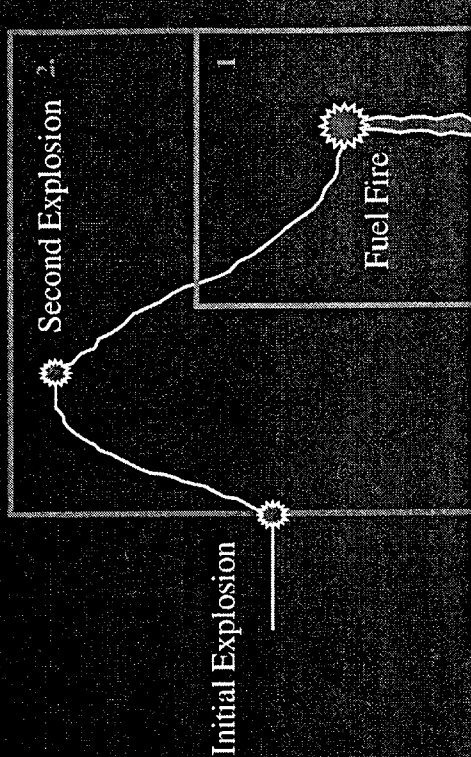
Method of Grouping TWA 800 Eyewitnesses



Groups 1 & 2 limit observations
to *after* initial explosion

Group

1. Observes only end event
2. Observations begin close to but after initial explosion
3. Observations consistent with Group 1 or 2, but description includes "object hitting aircraft"
4. Observations inconclusive



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Group 1: 146 Eyewitnesses



Eyewitnesses assigned to Group 1, only observe events at the end of TWA 800's flight, and, therefore, could not have seen missile cause the initial explosion.

Second Explosion

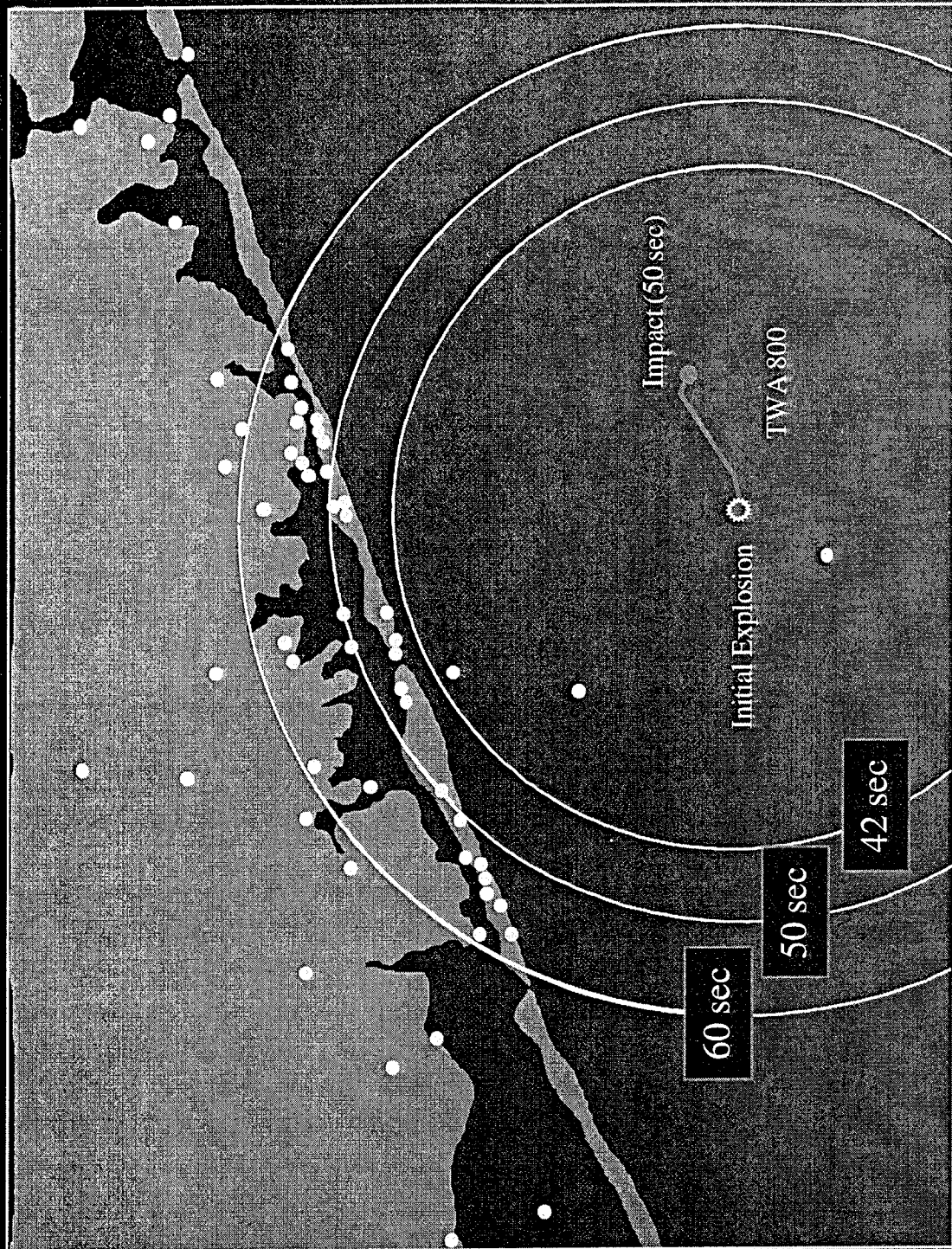
Initial Explosion

Fuel Fire



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Group 1: Observations Begin Close to Hearing First Sound



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Wing Separation



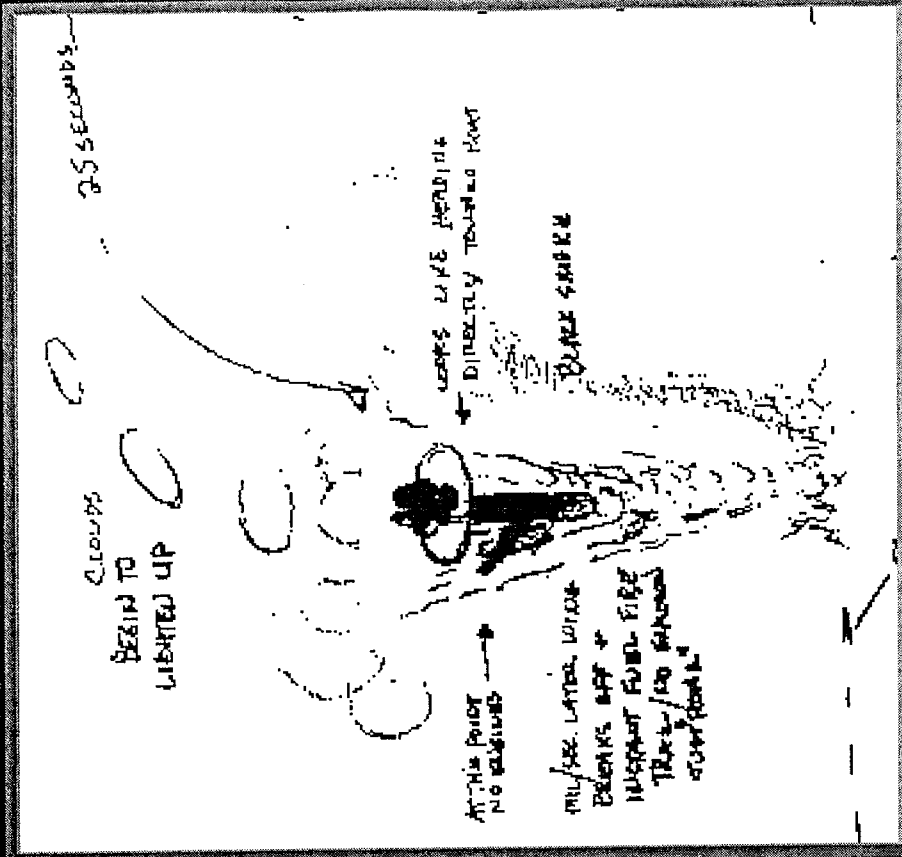
-- Debris show the left wing separated from the aircraft and was intact

-- W.P. [21] "It (the light) then grew more intense in brightness and broke into two, red balls of fire".

-- A.L. [26] "...entire right wing separates from fuselage, and peeled back, alongside the fuselage...". The entire wing was intact and did not observe engines.

-- D.G. [29] "...the fireball broke into two pieces; one pencil-shaped or telephone shaped, and one shaped like a circle".

-- A.C. [47] "...witnessed a small explosion, followed by two (2) 'tremendous' explosions, then two large objects falling toward horizon".



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TWA 800 Timeline



Initial
Explosion
($T_0 = 0831:07.496$ PM)



$T_0 + 15$ sec

Onboard flight data and voice recordings end at $T_0 = 0$; cockpit separates within 4 sec (last transponder radar signal received at 0831:12.133 PM); aircraft pitches up dramatically.

Two or 3 secondary explosions occur over a 2-sec period beginning at about $T_0 + 15$ sec (witness and sound propagation analysis).

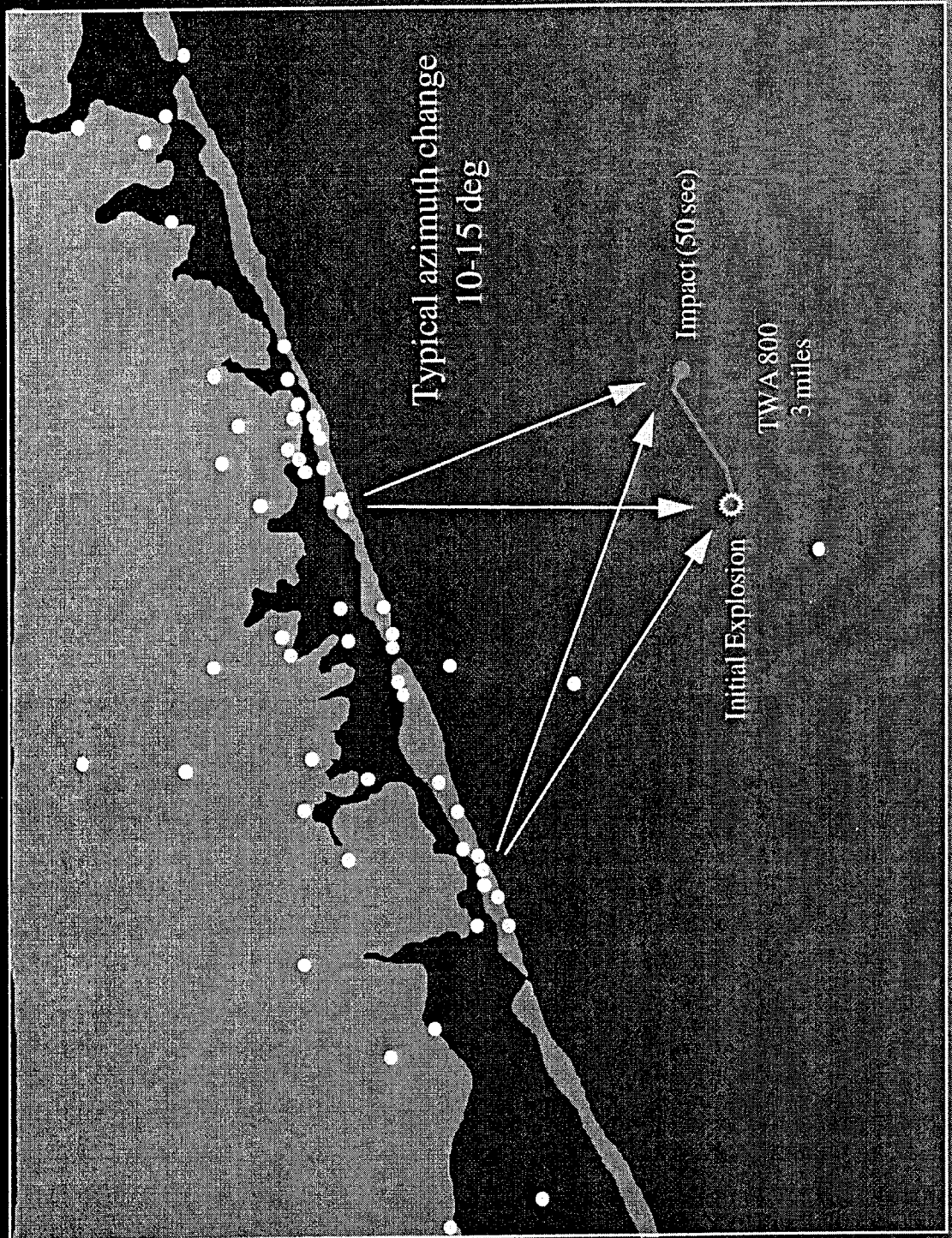
While at altitude of about one mile, aircraft hooks to left and downward; right wing separates from fuselage at $T_0 + 42$ sec (witness and sound propagation analysis); "fire trail" erupts. (Infrared "hit" at $T_0 + 43.5$ sec, detects heat of "fire trail.")

Left wing and most of rest of plane impact water; wing trails rest of plane by 1-2 sec (witness and radar "skin track" [0831:58 PM]).

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Group 1: Eyewitnesses Observe Only Vertical Motion



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Where Were Eyewitnesses Looking?



<u>WITNESS</u>	<u>AZIMUTH TO TWA 800 WHEN RECORDINGS END</u>	<u>AZIMUTH TO TWA 800 "WING SEPARATION, FIRE ERUPTION"</u>	<u>AZIMUTH CITED BY WITNESS</u>
J. & T.C. [--]	87.31°	85.00°	84.1°
K.B. [--]	98.58°	93.07°	96.1°
A.C. [47]	119.48°	110.31°	84.1°
B.K. & D.F. [73]	149.82°	131.15°	136.1°/141.1°
A. & J.C. [112/113]	161.69°	145.52°	138.1°/146.1°
V. & S.S. [114/115]	180.73°	161.19°	163.1°
J.D. [52]	189.15°	174.98°	171.1°/173.1°
R. & L.C. [50]	219.89°	214.82°	211.1°/209.1°

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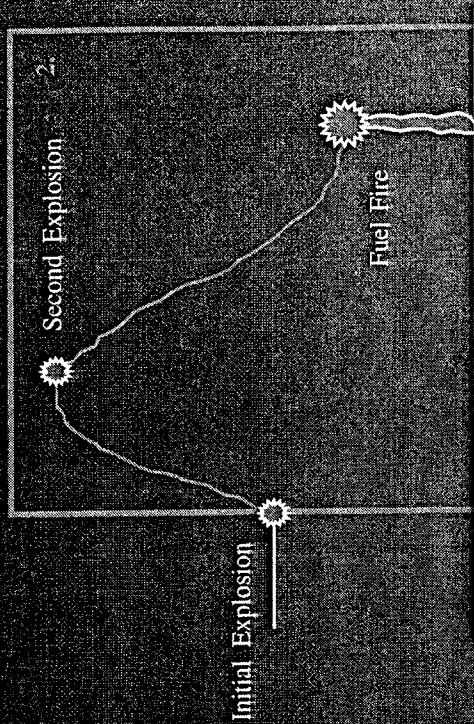


Group 2: 18 Eyewitnesses' Observations Begin Near Initial Event



- See only single object...hence did not see missile and aircraft
- See object ascend and descend... most see end fireball

Observations correlate with TWA 800 trajectory



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“One Continuous Motion...”



- Most eyewitnesses describe observations as “one continuous motion.”
 - Airborne witness “V.S.”: “...it seemed all *integral, transitioning from ascent to descent in a fluid motion.*”
- This is inconsistent with “missile hitting aircraft,” because aircraft and missile most likely would be traveling at different speeds and in different directions.

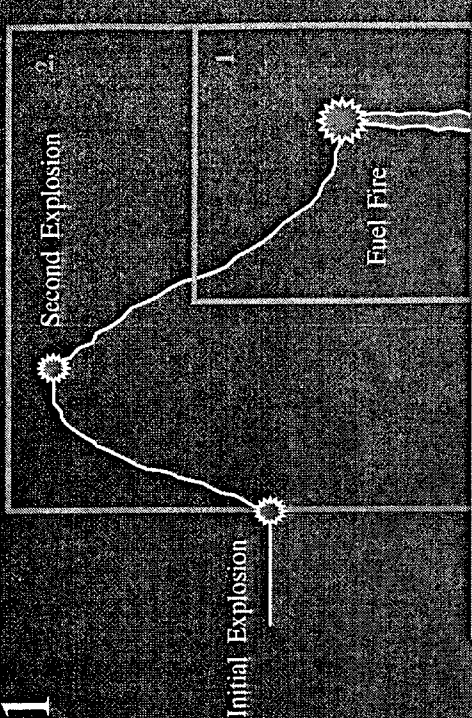
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Group 3: 8 Eyewitnesses See "Object Hit Aircraft"



Eyewitnesses *do not* describe an object and aircraft simultaneously

Seven (7) eyewitnesses are in Group 1
(End Event Only) and could
not have seen missile
strike aircraft



One (1) eyewitness is in Group 2

- Witness probably interpreting observations incorrectly
- Need to re-interview witness

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Remaining Eyewitness - A.C. [47]

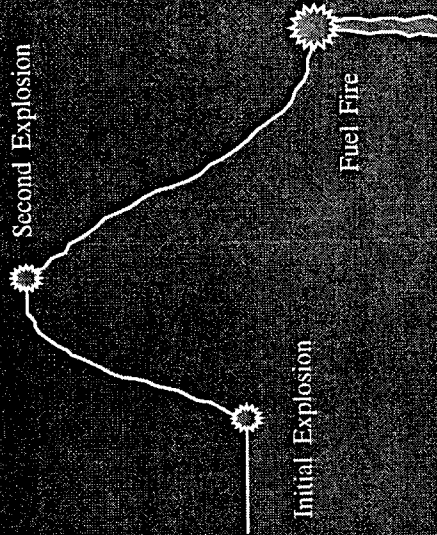


Observations

- Observed red object ascending for 30 sec from *East to West*
- As object reached zenith, it arced over, traveled horizontally for 10 sec, followed by a small explosion and 2 tremendous explosions
- Finally, saw two objects fall toward horizon

Conclusions

- Likely saw most of event due to extended observation time
- Observed end event with explosion and two falling objects
- Observations consistent with aircraft hypothesis *except for East to West motion*



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