Forensic Flight Reconstructions

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Many varieties of information exist that allow an investigator to recreate the flight path of the accident aircraft. Often a clue as to what occurred can be obtained from knowing that flight path completely. In general, information about the flight path may come from many sources. They include:

a. Survivor statements
b. Witness statements
c. Radar reconstruction
d. Flight plan documents
e. Flight Data recorders
f. Cockpit voice recorders
g. Military radar sights
h. Other sophisticated computer memories

A. RADAR RECONSTRUCTION

When a civilian or military aircraft crashes that was flying under an instrument flight plan it is usually controlled by one of the many air traffic control facilities. Radar coverage is such that the aircraft is usually being tracked by one or more facilities simultaneously. If an investigator acts quickly, researchers the radar coverage, he can contact the controlling facility and others with radar coverage in the area. He should demand preservation of the radar tapes that cover the area of route of flight of the accident aircraft.

Often the F.A.A. and military facilities are contacted by the accident investigator in charge of the accident investigation. He will usually have asked for a print out of data, and possibly ask for preservation of the data tapes for accident board review. In the case of a civilian accident, the F.A.A. will preserve such accident or printouts, but will not routinely include them in accident reports, nor will they retain computer tapes unless requested to do so. If they are preserved, they will be kept 5 years under present regulations. Otherwise, they will be discarded and tapes returned to service in fifteen days. A good private investigator should find out if such tapes were requested to be saved and if not act hastily and request there preservation. A well-drafted request for preservation should be made directly to the facility manager as well as to the regional legal counsel of the F.A.A. that has jurisdiction over the facility. I make my request by phone, backed up by FAX and registered letter. Either act expeditiously or face the probability that the tapes will not be preserved.

An investigator should search out the radar coverage in the area. For instance, assume an aircraft goes down in down town Houston while under control of Houston Air Route Center control. Obviously, you would ask for Houston Center tapes, but the same airplane might show up on Houston Hobby departure radar, Houston Intercontinental departure radar and Ellington A.F.B. radar. The point is to get them all.

Additionally an airplane flying on visual flight plans in good weather is not being controlled by any facility, but he is still being tracked by various facilities so preserve the tapes.

Depending where the crash occurs the military may have extensive coverage as well. The most common radar data is that obtained from the F.A.A. and it is usually in the form of APPROACH and DEPARTURE radars and the Air Route Traffic Control radars.

Approach and departure control radars usually scan out from the airport to a distance of more than forty miles with responsibility for aircraft within forty mile to an altitude of 10,000 feet.

Air Route radars cover the entire United States from ground to the highest usable altitudes in the structure. Radar is generally line of sight and so it is somewhat restricted in its low altitude coverage due to curvature of the earth. There is a complex formula relating to antennae height and aircraft height above ground that tells radar altitude coverage in remote areas. Thus in Charlotte Texas a town 65 miles South of San Antonio Texas, the lowest radar coverage begins about 1,800 feet above the ground.

Both the approach and air traffic radars give the controller a computer-enhanced display. This means that the controllers display is not actually painting the aircraft itself. Instead it displays a computer enhanced aircraft that is supplied a computer generated display information tag. This tag travels with the aircraft across the controllers' scope. One tape exists that store all information seen by the controller on his scope. Retrieval of such a tape can allow it to be replayed on Center training radar and you can recreate exactly what the controller saw on his scope as he controlled the aircraft.

Inside the system, there is a computer that smoothes out motion of the aircraft from what would have been jerky movements. The radars actually derive data from the target airplanes by illuminating them with radar pulses that are reflected from the aircraft as skin paint. Additionally after the airplane has been illuminated by radar, pulse an onboard device known as a transponder and encoding altimeter are triggered to transmit data about the aircraft back to the ground facility. The information learned is displayed on the information tag. The radar dish itself rotates 360 degrees every 12 seconds and so data is updated at that interval (some rotate more quickly)

The data displayed includes the aircraft assigned code and altitude and speed. An investigator can order a computer spill on the radar system and from this, the target aircraft's progress can be plotted a recreated in three dimensions.
Data available is:

a. Geographical location of datum
b. x coordinate of airplane
c. y co ordinate of airplane
d. Altitude of airplane
e. Time
f. Heading
g. Airspeed

The investigator can get a large graph paper and plot first the geographical location of datum. Usually this information is given by latitude and longitude, and it may coincide with the radar sight location. Depending on the type of radar spill you get from the computer the aircraft position will be given in lat -long or miles from datum on the x - y coordinates that parallel lat long lines.

The researcher can then take the last several minutes of flight, starting with the last radar return and plot backwards. With each plot he should write in each airspeed and altitude. Next, he should plot the coordinates of the ground impact. From this data you can get a rough idea what the aircraft was doing immediately before impact. This is very important especially in midair separations.

Experts who have worked as radar controllers and Radar Reconstructionist for the F.A.A or military are utilized for expert testimony and to do the graphing appropriately. There are many good experts available for this work. Often the N.T.S.B. does this precise work as inclusion in their report as well. When this occurs, you should hire an expert to check the work.