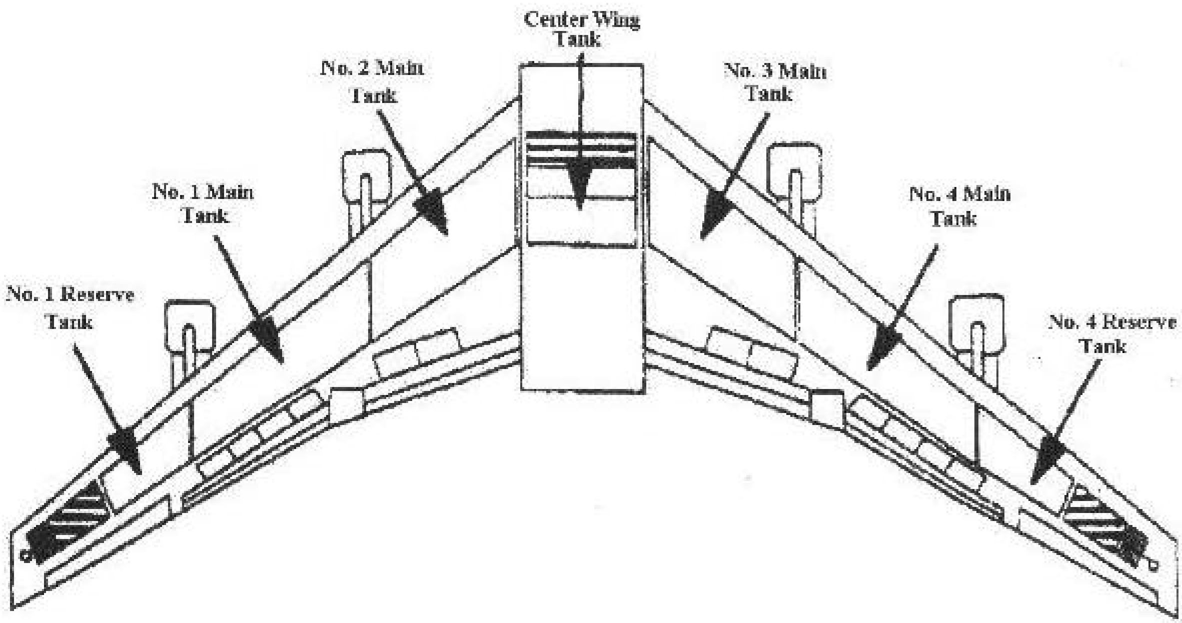
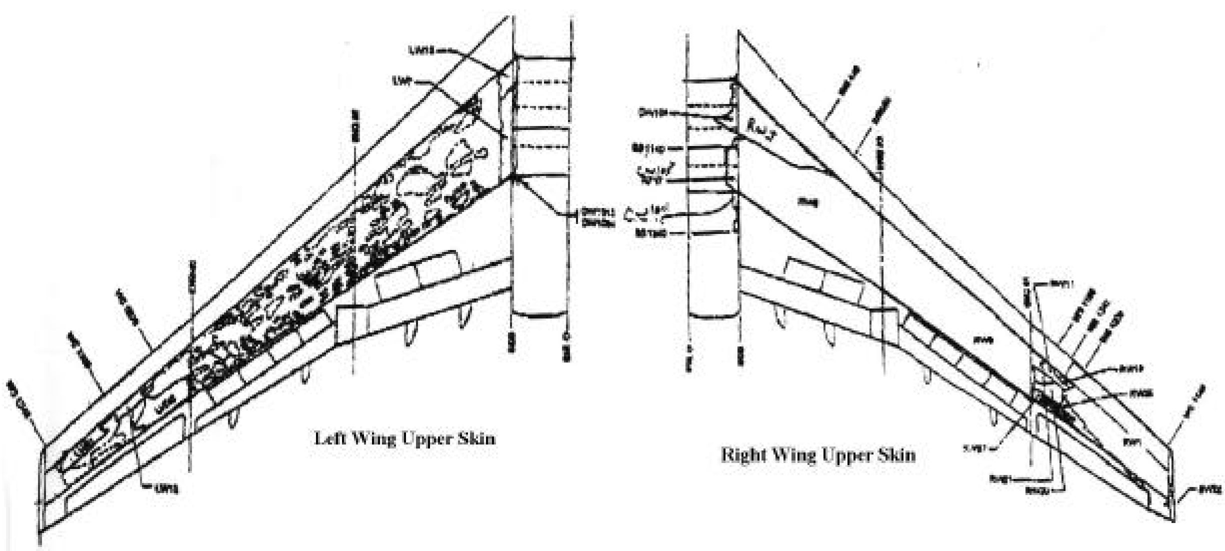
EXHIBIT 7 - WING SKIN FRAGMENTATION

By William S. Donaldson Cdr. USN Ret.

The first diagram shows a normal 747 wing with the location of the wing tanks and the second diagram shows the fragmentation of the upper skin of the left wing. This diagram was produced by analysts at the China Lake Naval Weapons Center. Only hydraulic RAM forces could produce this type of damage pattern.





1. Note the comparison of right and left upper wing skin damage. The bottom skins of both wings do not show this pattern.
2. Note the right wing is far less damaged despite a harder impact with the ocean. It was attached to the heavy fuselage at impact; the left wing was not.

3. The outer third of each wing separated early in the break-up sequence from high G overload.
4. Note extensive damage to left upper wing skin was confined to areas immediately over full or nearly full wing tanks. This implies the damage was a result of hydraulic RAM forces conveyed by fuel immediately under the skin.
5. Note the center section of the left wing sustained the most extensive damage, immediately over the number one main tank. This implies the hydraulic RAM pressure in number one tank was greater than in the number one reserve tank to the left, or the number two main to the right, next to the CWT.
6. This pattern further implies a CWT explosion was not the cause of wing skin damage because of less pressure in the adjacent #2 main.
7. This pattern also implies centrifugal forces were not at work after total wing separation because the outer panel was already damaged and separated with the same pattern prior to the total left wing detachment.
8. The most likely scenario that would explain this pattern would be a high energy blow delivered to a large area of the bottom wing skin centered under the number one main tank. In order to preclude damage to the bottom skin, the blow would have to be both powerful and of very short duration. A high explosive shock wave would deliver such a blow. Depending on the angle of impact, the overpressure would last only a few milliseconds, and would hydraulically load the tank fuel through the bottom skin. Because the fuel is a non compressible liquid, it would simultaneously resist the inward deformation of the bottom skin and deliver the totality of the blow to the bottom side of the left wing upper skin, fracturing it.
9. Different aluminum alloys are used for top and bottom wing skin, specifically tailored to normal, in-flight loading. Wing bottom skin in-flight is under tension (wing tips are trying to bend-up) and the top skin is under compression (tips pushing together). Because of this, the top skin is more ductile to handle compression and the bottom skin more brittle (to handle tension). The fact the more ductile tip skin shattered and the brittle bottom skin didn't further points to a powerful outside force. A simple interior overpressure would have had the opposite effect.
10. Note the left wing smaller fracture pieces (highest energy) are located over the aft portions of the #1main and #2 main tanks. This could be because tank thickness is diminished at that area but it also could be from shock wave impact angle. If the shock wave struck from forward as well as below the wing, the overpressure would first begin to deform the forward lower skin up into the tank until what ever airspace available in the tank was displaced by non-compressible fuel. This would actually form a depression wave in the bottom skin moving from front to back of the tank at the speed of the shock wave. The upper AFT portion of each tank would not only experience the normal overpressure, but would receive additional RAM pressure from the wave effect slamming Aft into a narrower tank.
11. Note, this damage pattern conforms with initiating event overpressure data recorded on the FDR and CVR, tension failure on bottom fuselage skin forward, compression failure of top fuselage skin forward, first loss of cabin integrity forward fuselage, bottom to top, left to right crack propagation of the skin forward fuselage and discovery of small wing skin parts during dredging in the early debris field.
12. It most assuredly does not conform to a low-pressure CWT burn.