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SOME TECHNICAL AND STRUCTURAL ASPECTS OF THE SMOLENSK PLANE CRASH

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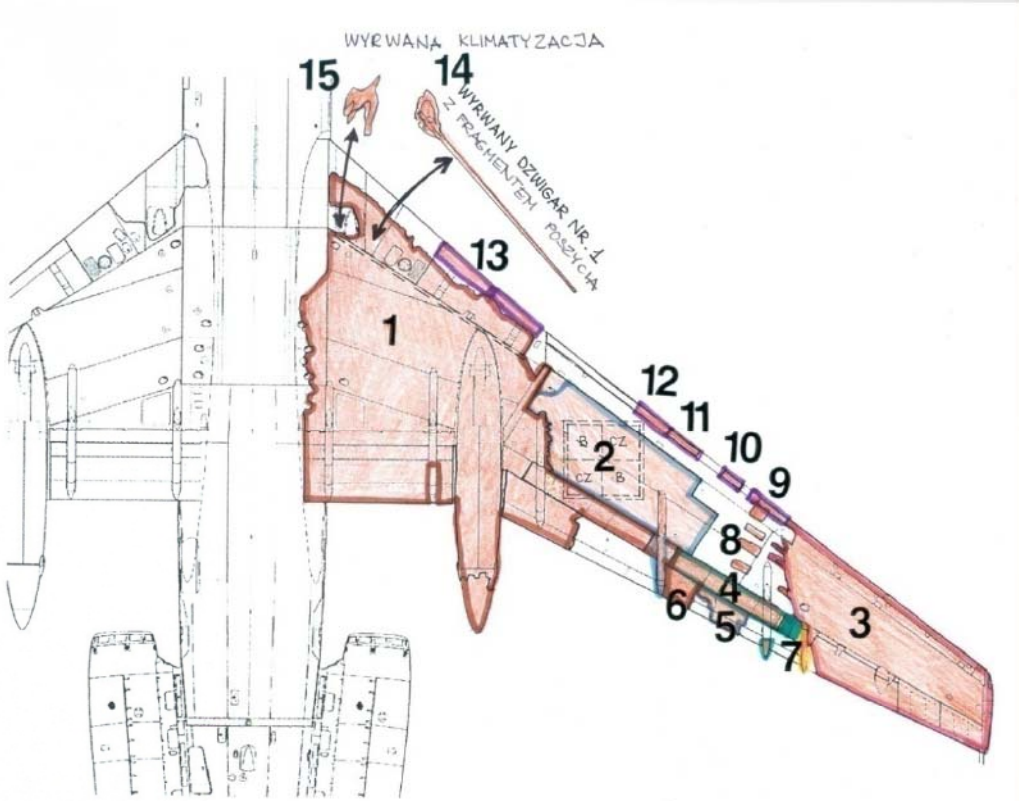
Dr Gregory SZULADZINSKI received his Masters Degree in Mechanical Engineering from Warsaw University of Technology in 1965 and Doctoral Degree in Structural Mechanics from University of Southern California in 1973.

From 1981 until present, he has been working in Australia in the fields of aerospace, railway, power, offshore, automotive and process industries, as well as in rock mechanics, underground blasting and military applications. Especially since the early 90'ties he has been doing computer simulations of such violent phenomena as rock breaking with the use of explosives, fragmentation of metallic objects, shock damage to buildings, structural collapse, fluid-structure interaction, blast protection and aircraft impact protection. He has done a number of state-of-the-art studies showing explicit fragmentation of structures and other objects.

He is a Fellow of the Institute of Engineers Australia, member of its Structural and Mechanical College, a member of the American Society of Mechanical Engineers and a member of the American Society of Civil Engineers.

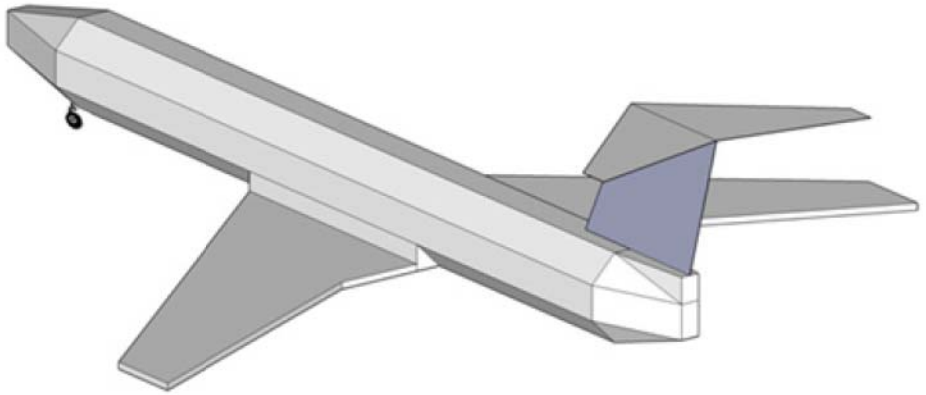
Data for analysis has been submitted by the Parliamentary Commission



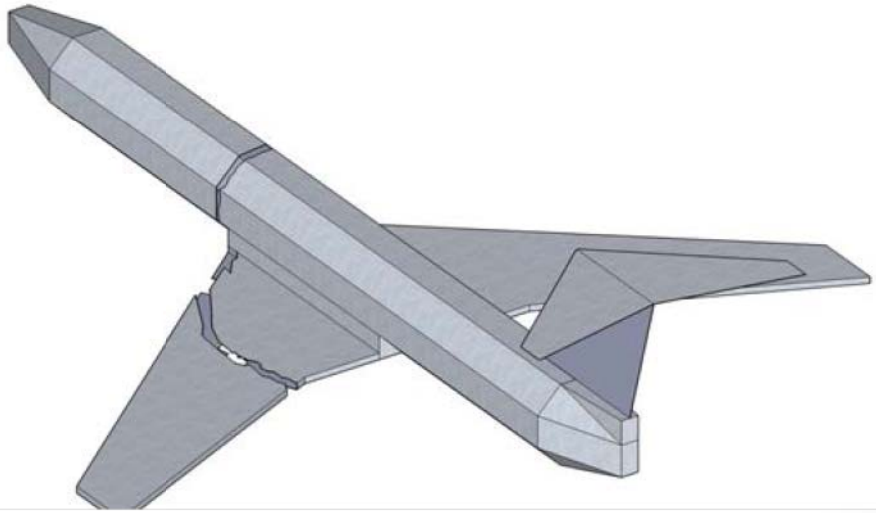
The airplane change magnetic heading after TAWS #38 on baro-altitude 37.5 m.

The left wing, view from the bottom. The parts are pieced together based on images from the day of the incident.

Phase I
Internal or external explosion in front of the left wing



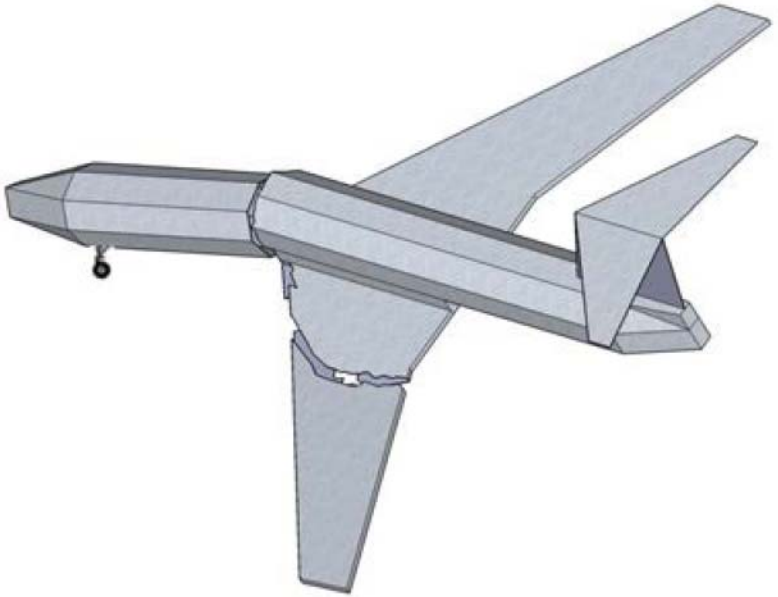
Phase II
Internal explosion in central position in airframe



The loss of the wing's leading edge near the fuselage and the entire left-most part of the wing had two aerodynamic effects: loss of lift on the left side and increase of drag. The first effect induces roll to the left, while the second one induces a change in magnetic heading.

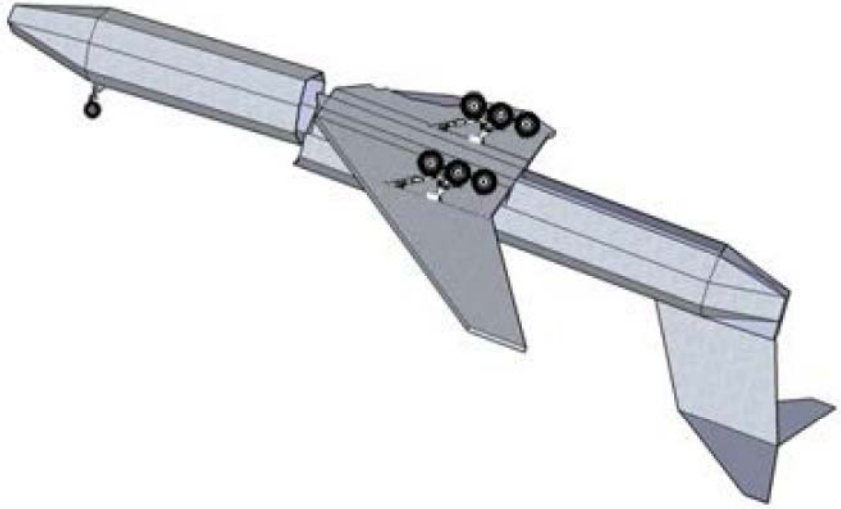
Phase III

The rear part of the airframe with wings and vertical stabilizer rolls to the left independently of the front part which stays in its natural position



Phase IV

Impact with the ground: only the rear part of the fuselage is inverted.



Angular momentum about the roll axis breaks the fuselage apart completely, separating the front of the fuselage from the rear, with the rear continuing to roll to the left.

Cockpit and front part of fuselage are not inverted

Rear parts of the fuselage in inverted position

Summary of Results

- The main causes of the crash were two explosions taking place just before landing.

- One of them impacted the left wing near its mid-point and caused an extensive damage, effectively breaking the wing in two. The other, inside the fuselage, caused an profound damage and dismemberment of the latter, as well as loosening the connection of the left wing and fuselage. The landing in a woody area, no matter how unfortunate and at what angle, was incapable of causing the documented fragmentation of the structure.