Journal of Consumer Attorneys Associations for Southern California
ADVOCATE

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Aircraft Accident Investigation:
Eight Tips for Deploying an Aviation Expert

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Aircraft accident investigation is considerably more complex than many other areas of forensic engineering. In accidents involving vehicles or consumer products, an expert from a single engineering discipline is often sufficient to analyze your case. Due to the complexity of aviation matters, however, multiple experts from a range of engineering disciplines are often needed. The goal of this article is to give attorneys some tips on how to effectively hire and deploy experts on their aviation cases.

RETAINING AN EXPERT

Retaining an expert can be daunting. You may worry about the cost of an expert, if the expert's findings will support or hurt your case, or if the expert's opinion might change over the course of the investigation. Problems with an expert can often be traced to the beginning of the expert's involvement. These tips should help avoid or diminish surprises.

Tip #1. Talk to and qualify your expert before hiring.

If you are unsure whether you need an expert, pick up the phone and talk to one. Most experts enjoy discussing new cases and are willing to help you find the right person for your case. Keep the conversation general until you are sure the expert or his/her firm has not already been retained. Even from a general conversation about your case, you can expect to glean insight into whether an aviation expert can help you, who that expert might be, and how much he/she might cost. Good experts are candid about their limitations and will tell you which issues they can address, as well as alert you to issues that will require other experts.

Once you find the expert you are looking for, ask that expert why he/she is qualified to work on your particular case. The expert should be able to relate how his or her education and experience will meet the scientific and technical demands of your case. Ask for a current copy of their curriculum vitae (CV) and read it as though you were opposing counsel. Clarify anything on the CV that concerns you. Thorough qualification of your expert at the outset can prevent problems later in the case.

Tip #2. Hire your expert early!

Hire your aviation experts as soon as possible after you are hired. Even if the National Transportation Safety Board (NTSB) still has custody of the wreckage and/or crash site, hiring your expert early not only prevents opposing counsel from hiring your expert, but also helps you focus your case and disregard non-plausible theories regarding causation.

An aviation expert can garner vital information from the accident scene, regardless of whether the

wreckage has been removed. Additionally, the scene can be reconstructed using photographs, videos, diagrams and in some cases, animation.

An experienced expert can discern important details from police, fire and autopsy reports, witnesses, survivors, media and pertinent FAA (Federal Aviation Administration) personnel. They can also examine official weather reports, pilot information (qualification, training, currency, medical) and the aircraft information (manufacturer, maintenance, operation.) These tasks can be accomplished before the wreckage is released, and provide a solid foundation going into the aircraft inspection.

Tip #3. Clearly define the scope of the investigation.

Four things define the scope of an investigation:

i. Priority: If an aircraft inspection, scene exam, deposition or trial is imminent, say so right at the start. In aviation cases there are often evidence examinations that take place at a central laboratory with all parties' experts present. If so, it is best for your expert (or his/her qualified colleague) to know those dates well in advance to ensure attendance.

ii. Resources: Discuss the timeline and budget for the investigation (including disbursements for travel, laboratory testing, etc.). In cases involving physical evidence it will be cheaper for you if your expert has a metallurgy lab and facilities for teardown and evidence storage. If a specialized inspection is required, this often calls for more exotic laboratory equipment than an expert would normally have. If so, ensure your expert is familiar with the equipment that is going to be used.

Keep in mind that the NTSB may take a year or more before releasing the wreckage.

iii. Constraints: Discuss what information is available, what physical evidence exists, and how accessible the scene and evidence are. Decide if a scene or evidence exam (aircraft wreckage/components, airfield, etc.) is feasible and/or necessary, or if a documents review is sufficient. If the evidence is transportable, shipping it to the expert can save money.

iv. Goal: Decide if your goal is to determine all factors that contributed to the loss, or only one or two root causes. If you are unsure, your expert can help by explaining the merits and cost of these alternatives. Whatever your approach, ensure that potential causes of the loss are not overlooked.

IN THE FIELD

Tip #4. Inspect the wreckage, get the evidence.

Not all aircraft accident investigations require fieldwork. Your expert can help you decide if the expense of fieldwork is justified. When fieldwork is necessary, he/she will know what steps are needed and how best to proceed.

In all but large commercial aviation accidents, you and your expert should be allowed to inspect the wreckage once the NTSB releases it. Be aware that the wreckage may have been altered since the accident. In many cases, the NTSB conducts destructive testing on vital aircraft components, sometimes rendering further evaluation impossible. Critical components may also be misplaced, lost or simply not returned. Occasionally the wreckage has been stored carelessly or been exposed to a harsh environment.

Although these alterations may prevent you from uncovering evidence to corroborate your expert's working theory, all is not lost. Inspection may still identify potential defendants (likely at a component or "vendor" level), as well as other experts you may need (e.g., a metallurgical engineer).

If component-level inspection or testing is needed, there are two standards that provide useful guidelines: American Society for Testing and Materials (ASTM) E860, 'Standard Practice for Examining and Preparing Items That Are or May Become Involved in Criminal or Civil Litigation' and ASTM E1188, 'Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator'. The fundamental tenet of these brief standards is "document and protect".

Ensure that neither your expert nor the experts of other parties conducts any testing without a detailed protocol in place outlining the entire scope of the procedure(s) and the witnesses to be present. All relevant parties must agree to, and preferably sign the protocol before testing commences.

ANALYSIS

The next step is for your expert to analyze the factors that contributed to the loss. This analysis should be done in the context of the goals set out in Tip #3.

Tip #5. Be careful what you give the expert.

If a "designated" expert is deposed or called to testify at trial, his or her work product is not protected from discovery. Everything in the expert's file must be produced to opposing parties. Experts will be accustomed to receiving statements of claim and defense, deposition transcripts, NTSB reports, maintenance records and other documents. If there are statements or particular documents you wish to remain privileged, do not give these to your expert.

Give clear direction to your expert regarding his or her record-keeping procedures. The rules of procedure and evidence vary between jurisdictions, and communicating your evidence rules will prevent the expert from becoming a liability by "over-documenting".

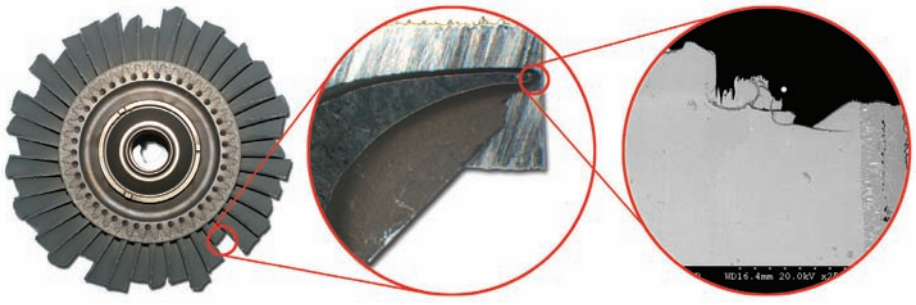

Figure 1. At left is a turbine disk from a jet engine. One turbine blade (circled) broke in two then damaged the rest of the blades and caused the engine to shut down, which led to an accident. The middle photograph is of the half of the broken blade that stayed in the disk. This blade had a crack that originated near the trailing edge (circled) and then grew undetected. A small slice was made through the crack origin (right). Viewing the slice in a microscope revealed the worm-like defects in the core of the blade that led to the fatal crack.

Tip #6. Discuss what documents are relevant and available.

Beyond depositions and other legal documents, a qualified expert can tell you what other information exists and how to obtain it efficiently. Furthermore, your expert can tell you which documents are relevant to your case and which can be omitted, saving you time and money. Table I describes examples and sources of documents frequently reviewed in aviation cases.

Tip #7. Share your theories, but listen to your expert's opinion.

Communicate to your expert what you believe to be the probable cause of the loss, but let your expert reach independent conclusions. The value of the expert is that he or she is objective and impartial. A good expert will not ignore relevant facts nor mislead you regarding the strengths and weaknesses of your case. The expert's findings may not always match your desired result.

REPORTING

Tip #8. Be clear on what type of report you want, and when you want it.

An expert's conclusions will need to be reported verbally or in writing. In many cases a verbal report is sufficient (and cheaper). Experts retain their files for many years, so a report can be written years after the initial investigation should the matter proceed to trial.

If you need the expert's results in writing, make it clear whether you want something brief that simply outlines the investigation and conclusions, or whether you want a report that conforms to courtroom admissibility standards, such as Federal Rule of Civil Procedure 26. The difference in cost of a short summary and a court-worthy report can be considerable.

Table I. Sources of information in an aviation case.

SOURCE	DESCRIPTION	WHERE TO FIND IT
Airframe log	Flight hours logged/ maintenance work performed on airframe	Owner/Operator/ Maintenance Facility
Engine log	Flight hours logged/maintenance work performed on engine(s)	Owner/Operator/ Maintenance Facility
Aircraft Maintenance Manual	Manufacturer's recommended/mandatory maintenance instructions	Same as above, or through manufacturer
Aircraft Data and Registration Information	Official aircraft registration, operating empty weight, weight & balance, specifications	Manufacturer
Airworthiness Directives	FAA-mandated inspection and/or maintenance that must be performed	FAA (Oklahoma City)
Service Bulletins, Service Letters	Descriptions of in-service problems and manufacturer's proposed solutions	Manufacturer, Freedom of Information Act (FOIA) request through FAA
Service Difficulty Reports	Reports given by operators identifying in-service problems with aircraft	Manufacturer, FOIA request
Engineering Requests	Engineering Orders, Specifications, Control Drawings, etc.	Manufacturer (through FOIA request, if necessary)
System Safety Report Requests	Hazard Analysis, Failure Modes/Effects Analysis (FMEA), Fault Tree, etc.	Manufacturer (through FOIA request, if necessary)
Aircraft Flight Manual/Pilot's Operating Handbook	Aircraft operating instructions, system descriptions, limitations	Manufacturer
NTSB Reports	Preliminary, Probable Cause, Final/Factual	NTSB website, FOIA request
Dispatch Release (if applicable)	Official dispatch release/ flight plan between pilot and dispatcher	Operator
Weather Briefing, Weather Radar Data	Applicable weather/reports for accident flight	FOIA request
ATC Tapes	FAA Voice and radio transmissions/Tower Movement Logs	FOIA request
Cockpit Voice Recorder (CVR) Data	Recording of cockpit voice audio/transmissions	FOIA request
Digital Flight Data Recorder (DFDR) Data	Data from hundreds of measurable aircraft parameters/ systems	FOIA request
Maintenance Personnel Qualifications	Training, records, enforcement actions	Maintenance facility (or operator, if same)
Aircraft Insurance Policies	Hull/Comp carrier	Owner/Operator
EMS/Police/Media and Eyewitness Reports	(self-explanatory)	NTSB Reports, internet
All Pertinent Pilot Information	Training, licenses, current medical, recent/overall experience, toxicology report, enforcement proceedings, etc.	Instructing facility, operator, FAA (Oklahoma City), NTSB Reports

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Clearly communicate to your expert the deadline for completing his/her report. Admissibility standards and deadlines vary between jurisdictions.

SUMMARY

Tip #1 Talk to and qualify your expert.

Tip #2 Hire your expert early!

Tip #3 Clearly define the scope of the investigation.

Tip #4 Inspect the wreckage, get the evidence.

Tip #5 Be careful what you give the expert.

Tip #6 Discuss what documents are relevant and available.

Tip #7 Share your theories but listen to your expert's opinion.

Tip#8 Be clear on what type of report you want, and when you want it.

These eight tips will help you find the right experts, optimize the effectiveness of your experts, and control the costs of your experts in cases involving aircraft accidents.

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