

Memorandum

To: Whom it may concern
From: John M. Lind CPCU ARM
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Subject: Contaminated air in airliner cabins,
A summary but comprehensive presentation

Ladies / Gentlemen:

Call it what we may, the FAA Reauthorization Act of 2018, Sensors, Section 326(d) in context with contaminated cabin air is made necessary by the failure of the RITE/ACER/COE congressionally mandated program. RITE ACER offered very little knowledge useful to understanding this most elusive occupational and public health hazard. Elusive, but fundamentally very simply understood, it continues to be a case of industry cover-up. If anyone would doubt this statement, ask:

- (1) Who is responsible to the people to know and understand the hazards arising from public service operations?
- (2) What is their responsibility for the cost of accidents and incidents incurred by employees and passengers during commercial operations?
- (3) Are they fulfilling their obligation?
- (4) The FAA does not investigate fume events. Defined as “incidents” under the Federal Air Regulations, investigation is not required. However, fume events cause fatalities and disabilities and as such require investigation. Why erroneously defined? Why no investigations?
- (5) Why after 40 years has the airline industry failed to solve the contaminated cabin air problem?

During the active ACER program, 2004 to 2014, air carrier executives did their collective best to control opportunity and dialog around this federal mandate. They controlled access to aircraft, chose the aircraft that could be evaluated, denied investigation on revenue flights, delayed supporting activities, and somehow, budgeted funding didn’t arrive when and where it was needed. Eventually, in pure pork barrel fashion, politicians usurped funds for their own pet projects at home.

How will the industry respond now to the requirements demanded by Section 326(d)?

Truth . . . as it is intended to apply to this discussion is the truth as I have experienced it.

I. The Airline Deregulation Act of 1978 – S-2493, 95th Congress.

You may have heard this before so I’ll be brief – Into the 1970s, government lawmakers grew more and more intolerant of high airfares that priced most of society out of air travel. The excesses of the Civil Aeronautics Board, regulator of all things necessary to air operations, had outlived its industry-protective usefulness. Carelessly, the U.S. Congress passed the Airline Deregulation Act of 1978. ⁽¹⁾

In doing so it forced upon airline managers an 18th century, poorly understood (or deliberately misrepresented), impractical theory of economics. ⁽²⁾ The expected aggressive competition began and continued for decades. Fares fell to operationally unsustainable levels leading to excessive cost cutting. Airline economics turned upside down as expenses fell to meet revenue. Employees were denied statutory workers compensation; ⁽³⁾ new aircraft and engine maintenance protocols became assurances that high costs of engine overhauls and bearing seal replacement could safely be avoided. ⁽⁴⁾

Executives now emphasize engine and APU degradation and remaining useful life (RUL). Thus, in some cases, old, run out engines and APUs become throw away items. Even problem aircraft are thrown away, reference B-767 N251AY, which is rumored to have burned at the gate in another land.

II. The Air Travel Experience – systemic deterioration in air transportation services.

Fifteen to twenty years of industry attrition and decay followed S-2493. Bankruptcies, mergers, acquisitions, hostile takeovers drove the industry to the brink of disaster. Passenger load factors increased and revenue fell, customer services were re-invented from complimentary into profit centers. Uncertainties ⁽⁵⁾ such as fuel prices, weather, maintenance imperatives, security, changing demand, and operating adjustments had to be endured under liquidity crises where the generous revenue structure under CAB rule once carried these burdens effortlessly.

With demand for seats ever climbing and surviving fleets expanding, the need to push aircraft utilization to new limits dominated the day. Creeping equipment deterioration occurred. Maintenance shortcuts ended or delayed necessary repairs. Aircraft with aging engines and APUs continued in revenue service. Gradually over the period from 1985 to the present, incidents of cabin air contamination grew. Auxiliary power units in tail cones high off the tarmac required maintenance platforms for access. They were often overlooked. Some of the worst cases of crew and passenger disability are attributed to the APU. Engine compressor bearing seals, a recognized source of engine oil “consumption”, which were regularly replaced before deregulation, have long exceeded their useful lives.

The most dangerous consequence of this systemic deterioration was increased incidents of smoke and fumes causing increased numbers of aircrew and passenger illnesses. Executives and regulators have ignored their safety and health responsibilities; these dangers remain with us today.

Major Unintended Consequences:

Deregulation wasn't a mistake; some say necessary. It was a poorly conducted process of inducement to bring more business into the air transportation industry. Instead of planning a gradual weaning-off from micro-regulations, air carriers were abandoned to “slug each other senseless” for survival. ⁽⁶⁾

- Deregulation rendered the airline industry *unaccountable* to all authority, state, Federal, and public opinion, except the FAA. Grossly, underfunded and poorly guided, the FAA is incapable of exercising its Congress-delegated authority.
- Cost cutting to extremes has created a system of constant whack-a-mole to try to keep ahead of recurring uncertainties and the costs thereof.
- Prevention in equipment maintenance and employee safety is now but a recollection from the past among the few who might remember.
- On-the-job injuries that had been a predictable routine in the airline industry, today are grossed up by the unanticipated *aerotoxic syndrome* casualties. Statistics were comprehensive and accurate! Once upon a time the OJI's were carefully recorded, marshaled for claimant indemnification, combed for loss control frequency and severity, shared with NCCI for rate making, and the National Safety Council for industrial ranking. All of that was my responsibility. Today most or all of it has been trashed by the airline industry.
- Carrier executives no longer comply with state workers compensation laws because they know the historical frequency and severity of accidents brought financial losses unserviceable in the mandated, low airfare, oversight-poor environment that is by definition, deregulation in a free marketplace.

III. Question. Is the contaminated cabin air issue the result of a faulty product?

I once thought the engine bleed air system was a faulty product, a product design defect. As a former aircraft products liability insurance underwriter (as well as workers comp), and having now had time to study the aerotoxic situation thoroughly, I am not so sure.

Powerplant designers, engineers, and manufacturers at the beginning of the jet age were designing for a revolutionary world of never before seen fast and high-flying aircraft. Previously, passenger aircraft would struggle to fly over mountain ranges at the lowest levels of the troposphere. Later piston

powered aircraft like the Boeing Stratocruiser and the Lockheed Constellation needed engine-driven superchargers to maintain sufficient combustion air for high altitude operation. These superchargers also offered enough excess compressed air for the cabins of these aircraft. Jet engines do not use superchargers. For jet travel then, designers would need a new design for routine flight where pressurized air would always be essential for air traveler comfort and survival.

Engine designers and engineers, however, were well aware of the possibility that engine oil could bypass oil seals at the engine bearing sumps. They soon decided that using engine bleed air as their basic resource for cabin pressurization and life sustaining oxygen was too much of a worry to contemplate. ⁽⁷⁾ Boeing produced its first production jet-liner, the 707, using clean outside air. Their design used bleed air to drive a turbo compressor (similar in principle to the supercharger) to compress and condition air for the aircraft interior. McDonald Douglas with the DC-8 and Convair, the 880, would follow with similar basic designs.

These aircraft needed four engines to assure thrust sufficient to sustain adequate performance in this new environment. Even so, they were underpowered. Just why designers, engineers, and manufacturers so soon abandoned the original clean air philosophy is not specifically explained in the literature. We must surmise:

- a) Air inlets feeding fresh air to turbocompressors created aerodynamic drag;
- b) Turbo-compressors added weight, hence drag.
- c) Turbo-compressors are an additional maintenance and cost burden.
- d) Rapidly evolving state-of-the-art designs created low and high bypass turbofan engines that produced an excess of thrust and compressed air.
- e) Inflation required financial reconsideration of cost benefits of equipment and wages.
- f) The Boeing 787 style electric generator-driven bleed free compressor system creates power loss at the gearbox-driven generators in addition to costs mentioned above.
- g) Both engines on the Boeing 787 have three generators – two for primary electrical demand and redundancy. The third is dedicated to driving the turbocompressor. If a B-787 engine should be lost during high altitude climb and cruise, one engine could not alone carry the additional demand for pressurization. The aircraft would be forced to descend.
- h) Weight of the entire bleed air system and its components is removed by this system, the VSFG – variable frequency starter generator. ⁽⁸⁾

These and any other possible burdens that increase flight duration, burn fuel, add maintenance, or in any way force deviations from regular operations so as to increase operating costs will be financially unacceptable to airline executives.

We note, therefore, that airline management is cost-driven – first, last, and always. They must operate on this basis. Manufacturers are challenged to meet this airline-imposed financial barrier and compete in the marketplace accordingly. Isn't it easy to see that research, development, and manufacturing of the airline aircraft and powerplant product have now evolved to the point of near perfection? *Can it be that the small percentage of imperfection, partly represented by leaky bearing seals, might be a current state-of-the-art limitation rather than a faulty design or manufacture?*

IV. Our history with sensors

Advocates for aerotoxic casualties have asked engine manufacturers to repair or replace turbofan engine bearing seals. The effort to do so leads to the practical decision that once engine disassembly is needed to replace the seals, a complete engine overhaul will become beneficial. The cost at this point, as high as \$3,000,000, is prohibitive to the overhauler's and manufacturer's customer.

Advocates have also asked aircraft manufacturers to install air sensors in the cabin or oil leak sensors in engines and ducting. One specific response from an engine manufacturer states, "We will not put anything on an aircraft that is not ordered by the customer".

Today constant monitoring of aircraft in operation around the world provides detailed, sensor-

recorded degradation data on turbofan engines.⁽⁹⁾ Engines can operate for 10 to 20 years or more without major maintenance. Air carrier executives now depend upon actual data showing low engine degradation rates and related useful life (RUL) to permit on-wing continuous operations for up to a not unusual 50,000 hours.⁽¹⁰⁾

Conclusion:

With all of the detailed engine monitoring, there are no sensors installed for the purpose of monitoring cabin air contaminants, not in the air, nor in the engines or ECS ducting. Installing such sensors to advise pilots when they need to make emergency landings and also advise of necessary maintenance would erase the cost saving benefits of the entire preventive maintenance protocol. No matter that aircraft become non-airworthy. No matter that flight attendants become permanently disabled from carbon monoxide poisoning; pilots and passengers too. No matter that this scenario has influenced non-compliance with state workers compensation laws. No matter that the airline industry, writ large, has become a swamp of financial fraud perpetrated for employer financial benefit at the expense of the innocent flight attendant, pilot, and unsuspecting passenger.

Forced into the deregulation corner . . .

This is the air transportation norm of operations today.

We anticipate sensor data confirming contamination in airliner cabins. Will the 117th Congress begin a process that will offset the folly of the 95th Congress? Will the results of compliance with Section 326(d) influence seal replacement? Will new designs result that will remove or mitigate the toxic fumes from airliner cabins? As air carriers recover from the scourge of a crippling pandemic will they have mood or desire to be rid of toxic cabin air? Or will they retreat into their tortoise shells of unaccountability?

Ill, injured, and disabled crewmembers and their advocates place themselves in positions to see that the best interests in human health and flying safety are practiced. After four decades of the international conspiracy of silence about contaminated cabin air, the traveling public deserves no less.

References:

- (1) (a) S.2493, The Act - . . . to encourage, develop, and attain an air transportation system which relies on **competitive market forces** to determine quality, variety, and price of air services
(b) CAB Closing – “Now they are on their own. **Free markets** and private industry do a better job than the Federal Government.”
<https://www.nytimes.com/1985/01/01/us/cab-dies-after-46-years-airlines-declared-on-own.html>
- (2) <https://corporatefinanceinstitute.com/resources/knowledge/economics/what-is-invisible-hand/>
- (3) Reports from crewmember testimony, the media, medical records. Cases of wrongfully denied workers compensation. Undeniable cases of fraud made possible by contracts between employer and claims service companies that in a regulated environment would be prosecuted as illegal purposes. To be assembled when needed to support purposeful action.
- (4) Preventive Maintenance - <https://www.sae.org/standards/content/arp1587b/>
- (5) Uncertainty-in-Airline-Revenue-Management.pdf
- (6) Hard Landing, Thomas Petzinger, Jr. Pg. 86 - “a naïve public establishment with the promise of low airfares if only Washington would force the airlines to compete. The airlines . . . were dragged kicking and screaming into the coliseum, where, like clumsy gladiators, they aimlessly slugged each other senseless. Only when it was too late did Congress grasp its folly.”
- (7) (a) 1953-0560.pdf, Comet Engineering, Air conditioning, 4th paragraph. Attached.
(b) <http://www.bleedfree.eu/wp-content/uploads/2015/10/Reddall-1955-elimination-of-engine-bleed-air-small.pdf>
(c) <https://scholar.smu.edu/cgi/viewcontent.cgi?article=1405&context=jalc>
- (8) Aircraft Powerplants, Wild & Kroes, 8th Edition, Page 410.
- (9) (a) https://medium.com/@hamalyas_/jet-engine-remaining-useful-life-rul-prediction-a8989d52f194
(b) <https://www.nasa.gov/collection-asset/chetan-kulkarni-and-external-partners-release-new-turbofan-engine-degradation-0>
(c) <https://publications.aston.ac.uk/id/eprint/43441/1/2021124272.pdf>
- (10) <https://www.reuters.com/article/us-air-show-engines-idUSBRE95F0F220130616>

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