

Aircraft Cabin Air Conference 2019

Contaminated Cabin Air

A Flight Safety Issue

Nick McHugh



In the
Opposite
Direction.





Elimination of Engine Bleed Air Contamination, Henry Reddall.

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ELIMINATION OF ENGINE BLEED
AIR CONTAMINATION

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North American Aviation, Inc.

For presentation at the
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SOCIETY of AUTOMOTIVE ENGINEERS, Inc., 29 West 39th Street, New York 18, N. Y.



BOEING

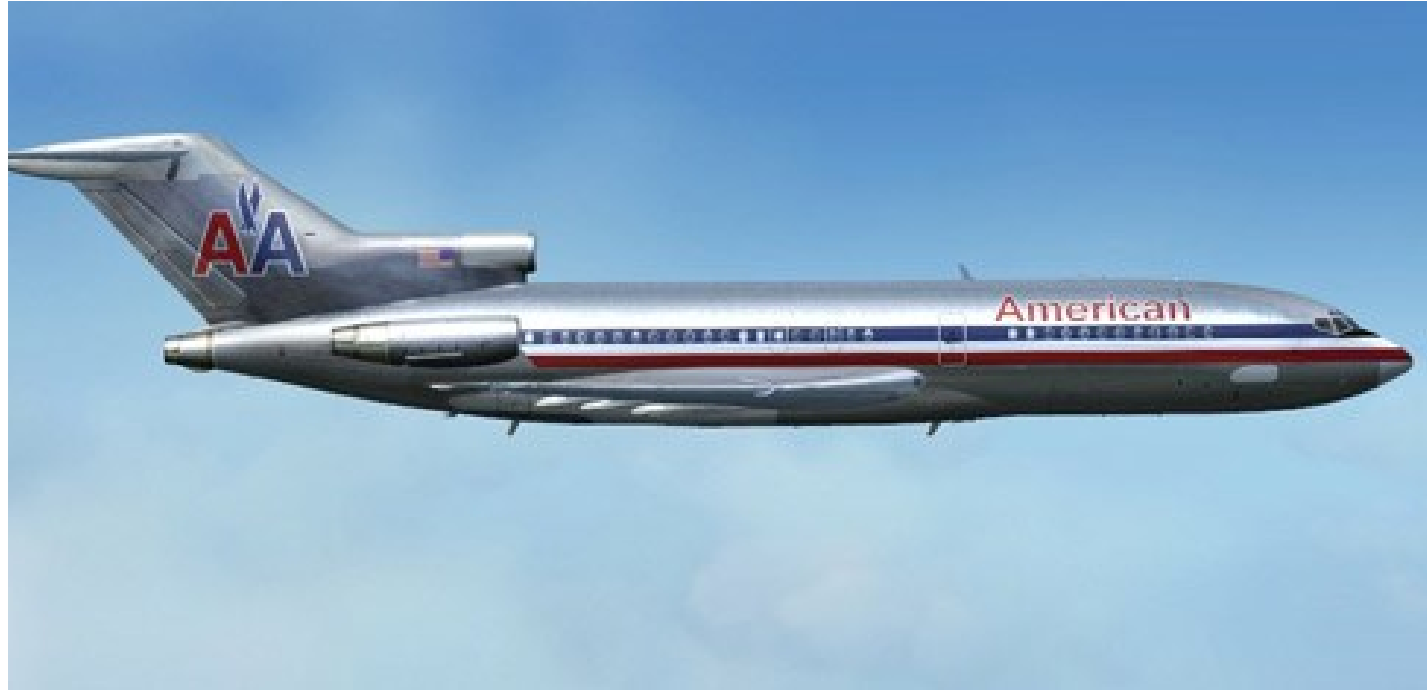
BOEING
707
N70700



Convair





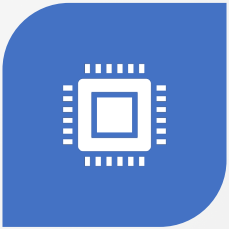


Boeing 727

So What Changed.



ADVANCES IN AIRCRAFT
MANUFACTURING
TECHNOLOGY.



ADVANCES IN ENGINE
SEAL TECHNOLOGY.



ADVANCES IN OIL
FORMULATION AND
PRODUCTION.



COSTS.



SHAREHOLDER VALUE.



THE AGE OF BLEED AIR.



History.



Airmanship.



Some Science.



Closer look at the facts.



Conclusions/Recommendations.

Overview

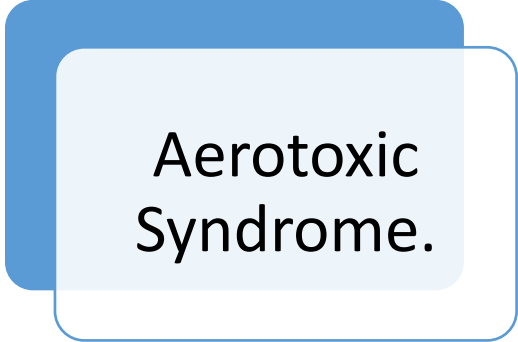
Self.

Aircraft.

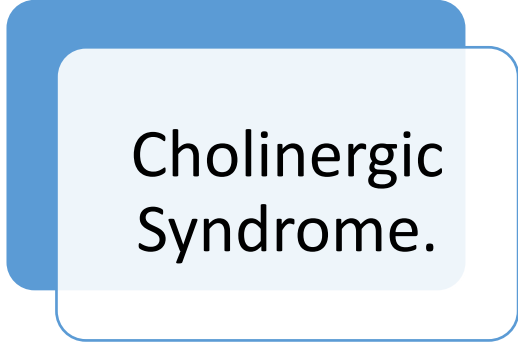
Environment.

Risk.

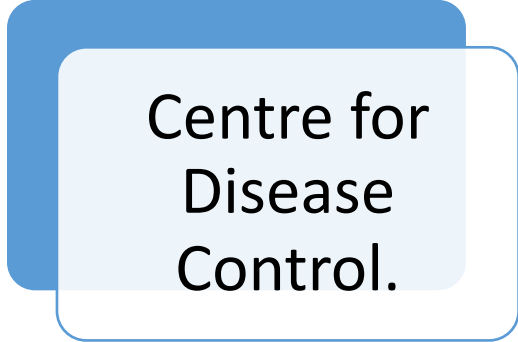




Aerotoxic
Syndrome.



Cholinergic
Syndrome.



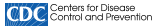
Centre for
Disease
Control.



Similarities

Self

Centre for Disease Control and Prevention (CDC)



Emergency Preparedness and Response

Nerve Agent and Organophosphate Pesticide Poisoning

TOXIC SYNDROME DESCRIPTION

The purpose of this document is to enable health care workers and public health officials to recognize an unknown or suspected exposure to a nerve agent or an organophosphate (OP) pesticide. Nerve agents are chemical warfare agents that have the same mechanism of action as OP organophosphate pesticides insecticides. They are potent inhibitors of acetylcholinesterase. Inhibition of acetylcholinesterase leads, thereby leading to an accumulation of acetylcholine in the central and peripheral nervous system. Excess acetylcholine produces a predictable cholinergic syndrome consisting of copious respiratory and oral secretions, diarrhea and vomiting, sweating, altered mental status, autonomic instability, and generalized weakness that can progress to paralysis and respiratory arrest.

The amount and route of exposure to the nerve agent or OP pesticide, the type of nerve agent or pesticide, and the premonitory condition of the person exposed person will contribute to the time of onset and the severity of illness. For example, inhalation of a nerve agent or an OP pesticide leads to a quicker onset of poisoning with more severe symptoms when compared to with dermal exposures, given the same amount of agent.

Signs and symptoms

The following is a more comprehensive list of signs and symptoms that may be encountered in a person exposed to a nerve agent or OP pesticide. Signs and symptoms are not listed in order of presentation or specificity. Also, partial presentations (an absence of some of the following signs/symptoms) do not necessarily imply less severe disease.

Central nervous system signs and symptoms

- Miosis (unilateral or bilateral)
- Headache
- Restlessness
- Convulsions
- Loss of consciousness
- Coma

Respiratory signs and symptoms

- Rhinorrhea (perfuse watery runny nose)
- Bronchorrhea (excessive bronchial secretions)
- Wheezing
- Dyspnea (shortness of breath)
- Chest tightness
- Hyperpnea (increased respiratory rate/depth) – early (increased respiratory rate/depth)
- Bradypnea (decreased respiratory rate) – late (decreased respiratory rate)

Environment

Hazards of our own making.



```
graph TD; A[Hazards of our own making.] --> B[Complex chemical compounds and UFP's]; B --> C[One chemical at a time/trigger limits]; C --> D[Directly and indirectly, separately and collectively.];
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Complex chemical compounds and UFP's

One chemical at a time/trigger limits

Directly and indirectly, separately and collectively.



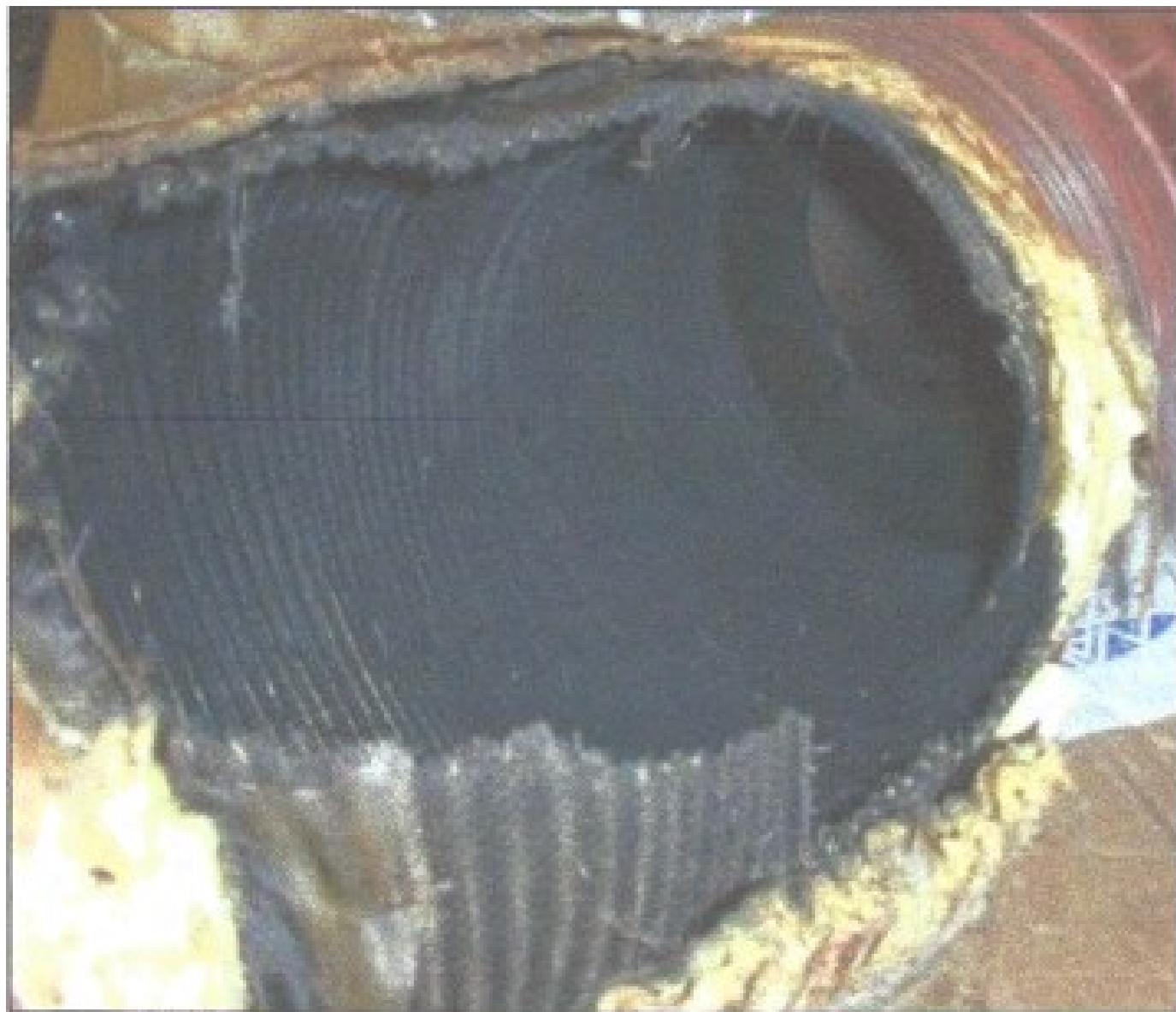
Aircraft.

- Anti wear TCP and complex mixtures of isomers, ester based stock, anti oxidants and other proprietary ingredients.
- Oil Change and engine 'on wing time'.
- Vapor-Phase lubricants / High temperatures and the Creation of Aerosol Nanoparticles under Bearing shear stress. (Bearing Squeeze oil.)
- Thermal degradation of small volumes of oil, and assured sequelae.



Uncontaminated
Ducting

Contaminated Ducting



EASA CS 25.831

Annex to ED Decision 2016/010/R

European Aviation Safety Agency

Certification Specifications

and

Acceptable Means of Compliance

for

Large Aeroplanes

CS-25

Amendment 18
22 June 2016¹

¹ For the date of entry into force of Amendment 18, please refer to Decision 2016/010/R in the [Official Publication](#) of the Agency.

Risk to Operations



NO DETECTORS FOR
CO² CO OR O³



CREW
INCAPACITATION, AND
ACUTE OVER CHRONIC
EXPOSURE
THRESHOLD.



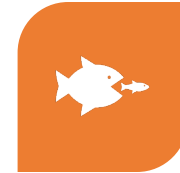
WHEN IS SMOKE NOT
SMOKE ? SELECTING
THE CORRECT
CHECKLIST.



DESENSITIZED SMELL
AFTER 3 MINUTES.



COMPLEXITY OF
SMOKE/FUME/SMELL
CHECKLISTS AND THE
RISKS ASSOCIATED
WITH SMOKE EVAC
PROCEDURE.



TRAINING.



LAND AS SOON A
POSSIBLE OVER
OCEANIC AND LARGE
LAND MASS.

Recommendations



Meaningful Steps.



Reporting.



Cabin Air Quality Sensors.



Bleed Free future Aircraft.



Medical Assessment Protocols



Enhanced Training (Recognise Characterize, Respond)



Long term Health effects.

Conclusion



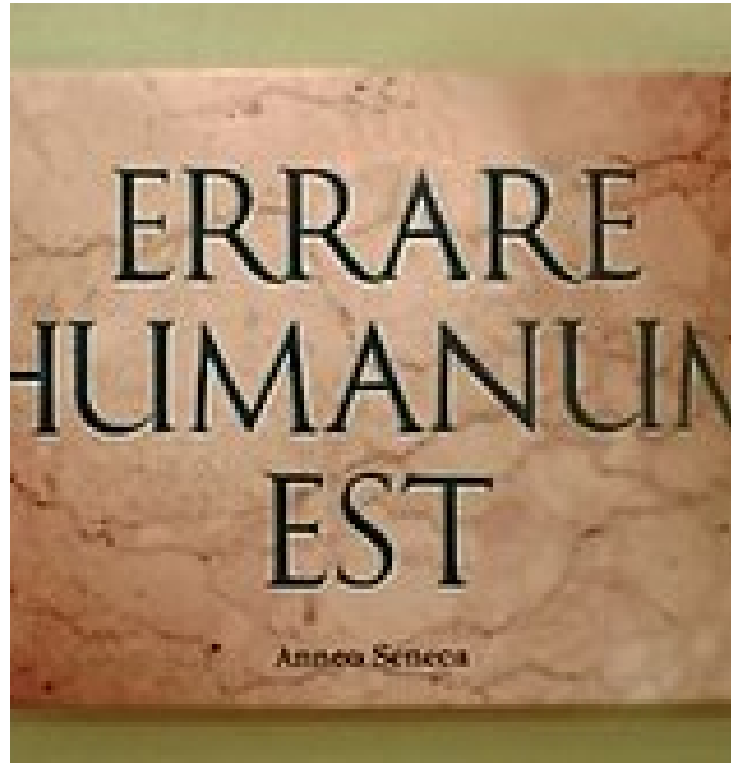
LONG TERM HEALTH



GENERAL FORESEEABILITY
OF INJURY OR IMPAIRMENT.



ULTRA FINE PARTICLES AND
THE BLOOD BRAIN BARRIER.



Lucius Seneca

- "Errare humanum est, sed perseverare diabolicum."
- To err is human, but to persist in error is diabolical.