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Job with Highest Risk of Radiation-Related Cancer Revealed

Analysis by Dr. Joseph Mercola | November 2, 2026

STORY AT-A-GLANCE

- Flight attendants and pilots ranked first and second among 503 U.S. occupations for the share of deaths from radiation-related cancers, at 6.9% and 6.7%, respectively
- Aircrew receive more occupational ionizing radiation on average than any other U.S. occupational group because less atmosphere shields them from cosmic radiation at commercial flight altitudes
- Career-long exposure is the main concern, as aircrew accumulate an estimated 3 to 6 millisieverts of cosmic radiation annually, compared with about 0.4 millisieverts from 10 cross-country round-trip flights
- Molecular hydrogen and astaxanthin are two antioxidant strategies discussed for supporting the body's defenses around flights — not treatments for radiation exposure or cancer risk
- Reducing linoleic acid from seed oils helps lower another source of oxidative damage, while adequate carbohydrates, protein, sunlight and regular movement support the cellular energy your body relies on for maintenance and repair

Flight attendants and pilots had the highest and second-highest shares of deaths from radiation-related cancers among 503 U.S. occupations. In a JAMA Internal Medicine study, researchers analyzed more than 12.7 million deaths from 2020 through 2024.[1] After accounting for age, sex and other factors, radiation-related cancers represented 6.9% of deaths among flight attendants and 6.7% among pilots.

High above Earth, less atmosphere stands between you and cosmic radiation — high-energy particles from the sun and deep space that carry enough energy to penetrate tissue and damage DNA. Commercial jets routinely cruise above 30,000 feet, so pilots and flight attendants repeatedly encounter more ionizing radiation, a form of radiation with enough energy to damage DNA.

In fact, aircrew receive the highest average annual effective dose of ionizing radiation of any occupational group in the U.S., including workers in nuclear power and medical settings.[2]

If you fly occasionally, those numbers sound alarming, but your exposure differs sharply from that of someone who spends a career in the air. Pilots and flight attendants accumulate an estimated 3 to 6 millisieverts of cosmic radiation each year. By contrast, a traveler who takes 10 cross-country round-trip flights in a year receives about 0.4 millisieverts. The concern centers on hundreds of hours at altitude year after year, not your annual vacation flight.

Pilots and Flight Attendants Had the Highest Rates of Radiation-Related Cancer Deaths

The JAMA Internal Medicine study examined whether pilots and flight attendants had elevated risk-adjusted mortality from cancers linked to radiation compared with people in other occupations.[3] Rather than treat all cancer deaths as equivalent, the researchers built their analysis around a specific question: If occupational cosmic radiation contributes to cancer among aircrew, would deaths cluster around cancers already associated with **ionizing radiation**?

That approach gave the researchers a built-in reality check. They expected workers with occupational radiation exposure to show one pattern and workers without that exposure to show another. They weren't simply looking for a statistical difference and then trying to explain it afterward. They tested whether the results lined up with a radiation-based explanation from the start.

- **Cancers unrelated to radiation served as an important comparison —** Researchers examined cancers that aren't considered radiation-related to see whether aircrew simply experienced unusually high cancer mortality across the board. They didn't. Aircrew fell near the middle of the occupational rankings for cancers unrelated to radiation.

  An across-the-board increase would point toward a broader explanation. Instead, the excess centered on the category researchers expected to rise if radiation exposure contributed to the pattern. That makes the association more specific, although it doesn't prove that radiation caused an individual cancer.

- **Other radiation-exposed workers strengthened the researchers' test —** Nuclear technologists served as another comparison group because their jobs also involve occupational radiation exposure. As the radiation hypothesis predicted, these workers ranked near the top for radiation-associated cancer mortality.

  That parallel gives the findings added context. The same type of cancer signal appeared in another occupation where radiation exposure is an established workplace concern. Researchers described this internal consistency as one reason the overall pattern was unlikely to reflect chance alone.

- **Ground-based aviation workers did not show the same cancer pattern —** Aircraft mechanics and assemblers provided another useful comparison because they work within the aviation industry without spending their careers at cruising altitude. Researchers didn't find the same elevated pattern among these ground-based workers.

  That comparison helps separate the act of working in aviation from the repeated exposure that comes with working in the sky. If some other aviation-related factor explained the entire association, researchers would have expected ground crews to show a similar signal. They didn't.

- **The study couldn't measure each worker's actual radiation dose —** The researchers acknowledged several important limits. Their data didn't reveal how much radiation each individual received, and occupations listed on death

certificates aren't always recorded accurately. People who already had a higher baseline cancer risk could also have been more likely to enter certain aircrew professions.

Other workplace exposures complicate the picture as well. Aircrew experience disrupted sleep-wake cycles and cabin-related exposures that the analysis couldn't fully separate from radiation. For that reason, the study establishes a strong occupational pattern rather than direct proof that cosmic radiation caused each cancer death.

- **Current U.S. protections don't match those used for some other radiation-exposed workers —** The Federal Aviation Administration (FAA) already recognizes aircrew as occupationally exposed to radiation, yet U.S. pilots and flight attendants have no federal dose limits and no federal requirement for routine radiation monitoring. Nuclear workers and aircrew in Europe operate under different radiation-protection frameworks.

  That regulatory gap turns the study's findings into a workplace safety question, not just an academic one. Monitoring cumulative exposure would give workers and regulators clearer information about how much radiation aircrew actually receive across a career. The study's authors argue that workers who receive substantial occupational radiation exposure deserve protections comparable to those provided to other radiation-exposed professions.

Reduce Your Exposure to Factors That Damage Cellular Health

If you work as a pilot or flight attendant, you can't eliminate cosmic radiation while you're at cruising altitude. Your first priority, therefore, is to reduce the exposures you have control over and strengthen your defenses against oxidative stress — the cellular damage that occurs when harmful free radicals overwhelm your antioxidant defenses. If you're an occasional traveler, keep the risk in perspective. The research discussed above reflects career-long aircrew exposure, not a few flights each year.

1. **Molecular hydrogen: an antioxidant strategy to consider before and during your flight —** Molecular hydrogen is one of my preferred strategies when I fly, as some research suggests it may help support the body's antioxidant response to oxidative stress — it is not a treatment for radiation exposure or a proven means of reducing cancer risk.

   Unlike conventional antioxidants that neutralize free radicals one-for-one, molecular hydrogen is thought to work differently; some research suggests it may help activate the body's own antioxidant enzyme systems, though this mechanism requires further study.

   I take molecular hydrogen just before takeoff because it takes about an hour for antioxidant response element, or ARE, pathways to activate. These pathways prompt your cells to produce their own antioxidant defenses. I then take molecular hydrogen once every hour for as long as I'm in the air.

   If you use tablets, the standard approach is to dissolve one tablet in 16 ounces of room-temperature water and drink it as soon as it dissolves. Cold water slows dissolution, which allows more hydrogen gas to escape while you wait. Don't use carbonated water because the carbon dioxide lowers the concentration of hydrogen gas the water holds.

   Another approach some people use is starting molecular hydrogen two or three days before a flight, the idea being that antioxidant defenses are already engaged when radiation exposure increases.

2. **Consider astaxanthin before you fly —** Astaxanthin is another antioxidant some people consider before flying, given its studied role in supporting the body's general antioxidant defenses — though it hasn't been specifically studied for protection against cosmic radiation exposure.

   This naturally occurring red-orange carotenoid, a type of antioxidant pigment, is found in microalgae and marine foods such as salmon and shrimp, as well as in krill oil. Timing matters. Some proponents suggest starting it at least three days before a flight rather than waiting until you're airborne.

If you fly frequently for work, some people use both strategies together — astaxanthin in advance and molecular hydrogen immediately before and during the flight — as part of a broader approach to supporting the body's antioxidant defenses. Neither strategy reduces actual radiation exposure or substitutes for medical guidance.

3. **Track your occupational radiation exposure —** If you're a pilot or flight attendant, find out whether your employer provides radiation-dose estimates or another way to track your cumulative exposure. U.S. aircrew currently have no federal requirement for routine radiation monitoring, even though the FAA recognizes aircrew as occupationally exposed to radiation.

   The FAA's Civil Aerospace Medical Institute offers a free program called CARI-7 that estimates the cosmic radiation dose for any flight based on route, altitude and date. You can download it from the FAA's radiobiology research page and use it to calculate the dose for individual flights or build a running total across your schedule.[4] It won't replace formal workplace monitoring, but it gives you a concrete number where none is currently required.

   Your cumulative dose matters more than what happens on a single flight. Keeping track of that exposure gives you a clearer picture of what you accumulate over months, years and eventually an entire career. It also gives you useful information when you consider other sources of ionizing radiation.

4. **Reduce linoleic acid (LA) to support your cellular defenses —** LA is a polyunsaturated fat found in especially high amounts in **seed oils**, including soybean, corn, sunflower, safflower, cottonseed and canola oils. These oils are also common ingredients in processed foods and restaurant meals. LA becomes incorporated into mitochondrial membranes, where its multiple double bonds make it highly susceptible to oxidation.

   When these fats oxidize, they form damaging compounds that interfere with mitochondrial structure and function, including the processes your cells use to produce adenosine triphosphate (ATP), their **main source of usable energy**.

Lowering your LA intake reduces one source of oxidative damage, helping your mitochondria better withstand the additional cellular stress associated with cosmic radiation exposure at altitude.

I recommend keeping LA below 5 grams per day and ideally below 2 grams. The simplest way to lower your intake is to eliminate seed oils and the processed foods that contain them and limit restaurant foods cooked with these oils. Favor more stable fats such as grass fed butter, ghee or tallow instead.

Lowering your LA intake is a long-term strategy rather than something you do only on flight days. The goal is to improve your cellular environment before another source of oxidative stress enters the picture.

5. **Support cellular energy with food, sunlight and movement —** Give your mitochondria the fuel and conditions they need to function well. I recommend about 250 grams of healthy carbohydrates per day for most adults, with more if you're highly active. Aim for about 0.8 grams of protein per pound of lean body mass (or 1.76 grams per kilogram), with one-third coming from collagen-rich sources like slow-cooked meats or bone broth.

   Regular movement and appropriate sunlight exposure provide additional support. Work toward daily walking of up to 60 minutes and strength training twice per week. If you've regularly eaten processed or restaurant food, which means you've almost certainly consumed a high-LA diet, avoid intense midday sun until you've been free of seed oils for four to six months.

   This is because LA oxidizes easily, builds up in your skin and increases your risk of skin damage. Once you've addressed that issue, sensible sunlight exposure supports cellular energy production and helps synchronize your circadian rhythm, an especially useful consideration if frequent flights and changing schedules disrupt your normal sleep-wake cycle.

FAQs About Pilots, Flight Attendants and Radiation-Related Cancers

Q: Why do pilots and flight attendants receive more cosmic radiation than most workers?

A: Commercial aircraft routinely fly above 30,000 feet, where the thinner atmosphere provides less protection from high-energy particles that come from the sun and deep space. Because aircrew spend hundreds of hours at these altitudes each year, their exposure accumulates throughout their careers.

Q: What did researchers find about cancer deaths among aircrew?

A: Among 503 U.S. occupations, flight attendants and pilots had the highest and second-highest shares of deaths from cancers associated with radiation. After researchers accounted for age, sex and other factors, these cancers represented 6.9% of deaths among flight attendants and 6.7% among pilots.

Q: Does occasional air travel carry the same concern as working on an aircraft?

A: No. The concern centers on repeated exposure over an entire career. Aircrew accumulate an estimated 3 to 6 millisieverts of cosmic radiation each year, while 10 cross-country round-trip flights expose a traveler to about 0.4 millisieverts.

Q: How can I support my defenses against radiation-related oxidative stress when I fly?

A: Molecular hydrogen is one strategy discussed for flight-related oxidative stress. Some research suggests it may help support the body's own antioxidant response, and it's typically taken shortly before takeoff and periodically throughout a flight. Astaxanthin, a naturally occurring antioxidant pigment, is another option some people consider when taken for at least three days before flying. Neither is a proven treatment for radiation exposure or radiation-related cancer risk.

Q: Why does reducing seed oils matter if you fly frequently?

A: Seed oils such as soybean, corn, sunflower, safflower, cottonseed and canola oil contain high amounts of LA. LA is susceptible to oxidation after it becomes incorporated into mitochondrial membranes. Lowering your intake reduces one source of oxidative damage, which helps your mitochondria better withstand the additional cellular stress associated with cosmic radiation at altitude.

This article is for informational purposes only and does not constitute medical advice. Consult a qualified healthcare provider before making changes to your health regimen.

Sources and References

- [1, 3] JAMA Internal Medicine August 17, 2026
- [2] TIME August 17, 2026
- [4] Federal Aviation Administration, CARI-7 and CARI-7A