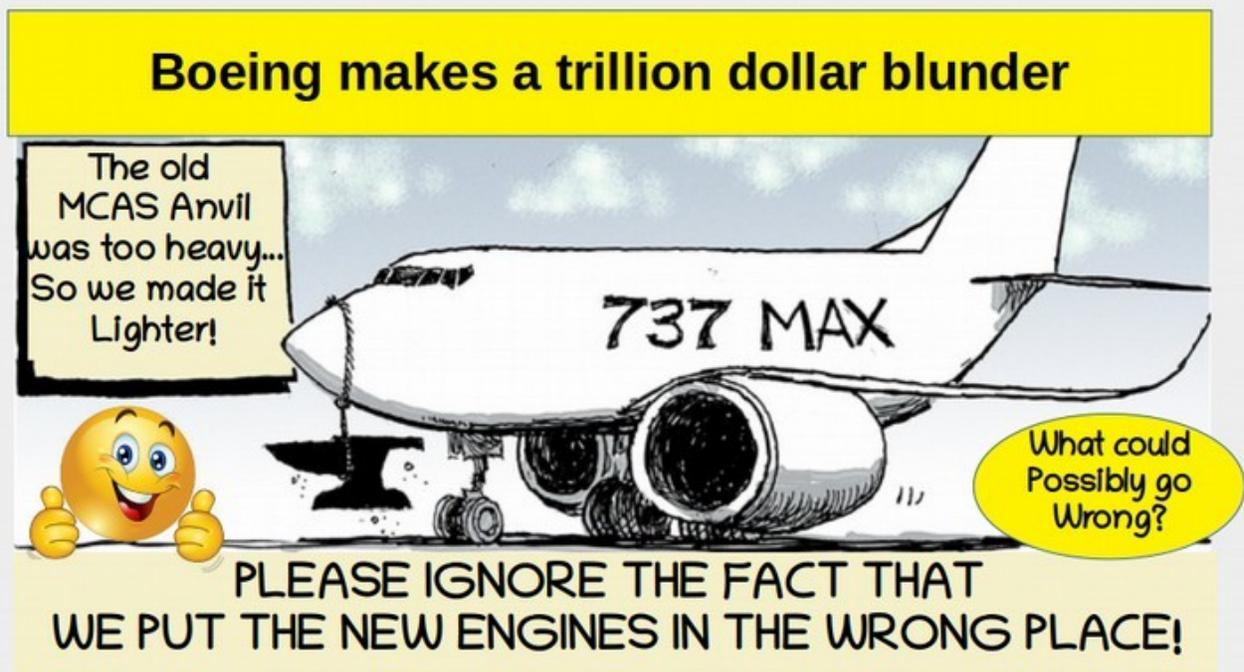


Why Boeing is Going...

The Deadly Path from Blackmail to Bankruptcy



A Special Report from Turning Point News dot org

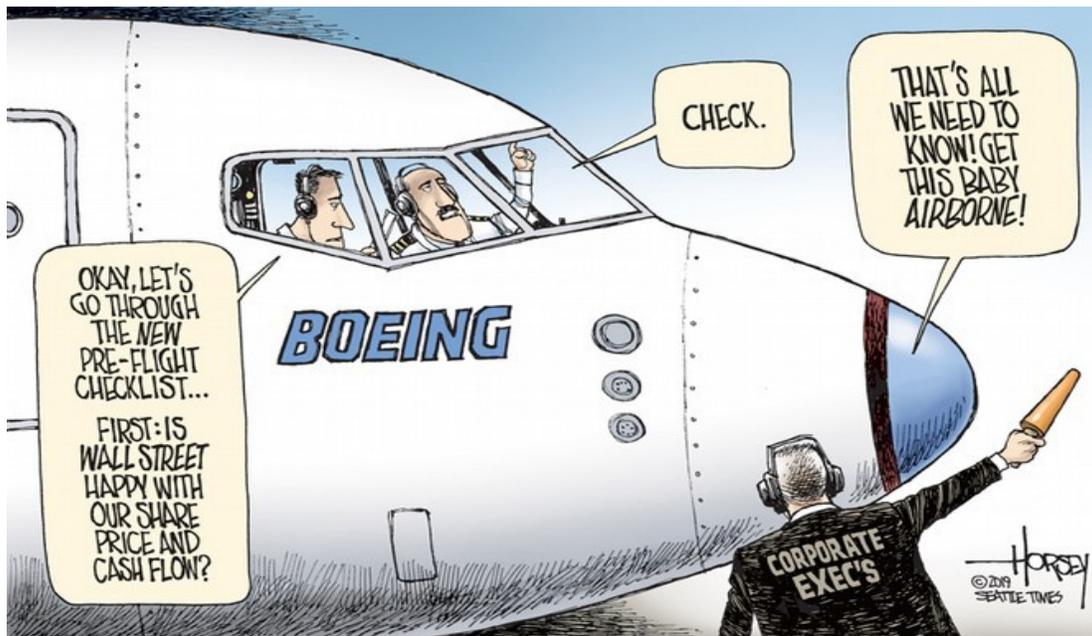
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Why Boeing is Going...

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Welcome to our special 109 page report which explains for the first time why the Boeing 737 Max is such an unstable airplane that it crashed twice during its first two years of operation – killing a total of 346 people. This report, called “**Why Boeing is going... The deadly path from blackmail to bankruptcy**” is the most detailed study ever published on the problems of the Boeing 737 Max.

The report explains step by step how Boeing made a trillion dollar error - inadvertently creating a plane that is so unstable that is literally designed to crash. This is not a problem that can be fixed with any software patch. This report provides evidence that it was not merely a flawed MCAS program or a flawed angle of attack sensor or flawed pilot training that led to two devastating crashes. While these were contributing factors, none of these facts explain why Boeing engineers were compelled to increase MCAS from 0.6 degrees to 2.5 degrees after field testing the 737 Max in 2016.

In this report, I explain why it is likely that one of the most complex forces in all of nature, a force called **turbulence**, was responsible for the need to radically change MCAS. I provide calculations showing that moving the new LEAP engine one foot forward and one foot higher than it was placed on the previous version of the 737 leads to a sudden increase in turbulence when the angle of attack exceeds 15 degrees.

This hidden instability problem means that no change in MCAS can ever make the 737 MAX a safe plane. In fact, reducing the power of MCAS will actually increase the odds of another 737 Max crash in the coming years. The only solution to this turbulence problem is a complete recall of all 737 Max planes.

Unfortunately, because each 737 Max costs \$100 million, a recall of all 500 737 Max planes currently in existence would cost Boeing \$50 billion – in addition to losing the opportunity to produce 10,000 more planes over time – for a total loss of over one trillion dollars. These are losses Boeing simply cannot afford.

Therefore, a complete recall of all 737 Max planes will likely lead to the bankruptcy of Boeing. As Boeing is one of the oldest and largest corporations in the world, the bankruptcy of Boeing will have ripple effects felt through out the world for years to come.

1 Introduction... Deadly by Design

This is a story the corporate media does not want you to know. It is an article about the demise of a once great airplane manufacturer. Many people are wondering how Boeing executives could have made such bad decisions that led directly to the death of 346 people.

This report will explain why the 737 Max problem is not merely a software problem. The real problem can not be fixed by any software patch. The plain truth is that Boeing placed short-sighted greed above human lives. This extreme greed led Boeing to built a plane that is so unstable it is literally **designed to crash**. Below is all that is left of an Ethiopian Boeing 737 Max that killed all 157 people who placed their trust in Boeing.



Boeing continues to place short term corporate profit above the safety of people. Therefore, more 737 Max planes will crash. More deaths will occur. Soon, no one will want to fly on a Boeing plane. Then, some day soon, Boeing will be out of business. Boeing is a corporation recently valued at more than \$250 billion dollars. But once the truth comes out, Boeing may have no value left at all. This will not matter to the people who made these terrible decisions. These corporate executives will have made millions of dollars in compensation and stock options. And thanks to our extremely corrupt government, none of them will go to jail.

Below is all that is left of an Indonesian Boeing 737 Max that killed all 189 people who placed their trust in Boeing.



In this article, I explain the history of how Boeing executives were seduced by short term greed, combined with extreme arrogance, to make such incredibly bad long term decisions. This is an important story because Boeing is not the only corporation that has been seduced by the desire to maximize short term profits. Boeing is not the only corporation to have corrupted democracy by buying politicians. My hope is that by telling this sad history, others may change course before their corporation suffers a similar fate. And I hope that voters will become wiser about the people they elect to represent us.

For more than ten years, I have written articles about a culture of corruption in the upper management of Boeing. I and many others have predicted that this would not turn out well. Now the lust for short term profits that was inbred in the Boeing culture of corruption has turned into a fatal virus called the Boeing 737 Max – a virus that has so infected its host that the case is now terminal. This article will explain why Boeing is going. There is no cure for the 737 Max. Thus, there is no cure for Boeing.

I am not happy to be proven right about the fatal flaws of the lies, greed and arrogance of Boeing upper management. My grandparents moved to Seattle in the 1930s to work at Boeing. Both of my grandparents knew Bill Boeing first hand. My grandfather helped start the Machinists Union at Boeing. Both of my parents grew up at Highpoint – a community not far from Boeing Field and built by Bill Boeing for his workers. I was born in Seattle not far from Boeing Field.

My aunt also worked for Boeing. I still have several more distant family members who work for Boeing. Many of my friends work for Boeing. And hundreds of my former students have worked for Boeing – some at Renton, some at Bellevue, some in Seattle and some in Everett. They are all about to lose there jobs. If you think this is an exaggeration, then you need to keep reading. Things at Boeing right now are not just bad. They are worse than your worst nightmare.

The full truth is not yet out. I am in a unique position to summarize the deeper and darker layers of this problem. It is not merely that I have been writing about Boeing corruption for years or that I know a lot about the inside story of problems at Boeing. It is that I have instructed courses in Problem Solving at Bellevue College for 20 years. I often used Boeing in my college courses as an extreme example of what happens when short term greed is placed above the long term interests of workers and the public.

I also have a degree in Science Education, including a major in Physics. I have taken courses in aerodynamics. I understand the complex equations of how planes fly. When I say that **the Boeing 737 Max is the most dangerous commercial airplane ever built**, I am not saying it to be mean. I am saying it because it is a fact. As I explain further below, the 737 Max is a very unstable plane. It was badly designed – so badly designed that it can not be fixed by any software program. Boeing and their accomplices at the FAA are simply misleading the public and investors on this issue when they pretend that the 737 Max only needs a software patch.

One thing humans have trouble understanding is the consequences of events that have low probability but highly adverse outcomes. Plane crashes are different from car crashes in that when a car crashes, typically only a few people are killed. A fatal car crash barely makes the newspapers.

But when a Boeing commercial jet crashes, close to two hundred people are killed and the event makes the news all over the world. Plane crashes are extremely bad advertising. It does not matter that 10,000 Boeing planes were in the air that day and only one of them crashed. People have vivid imaginations. People make emotional not rational decisions. If people know that they can fly on a well designed, stable and safe Airbus 320 Neo or fly on a poorly designed, unstable and dangerous Boeing 737 Max, they will either fly on the Airbus or they will not fly at all. Price is no object when your life is at risk.

The day the public finally finds out about the real danger of the 737 Max, is coming because the 737 Max is a terribly designed Frankenstein airplane – unlike any other commercial airplane ever built. In this article, we will show that the new LEAP engines were simply placed too far above the wing. This is the problem that cannot be fixed by a software patch. This is the real danger being hidden from the public.

Instead of scrapping this plane, it is likely that by August 2019, the FAA will approve the software patch. Once the FAA allows this plane back up in the sky, there will be more crashes – just as sure as there is rain in Seattle. Once another 737 max crashes, the public will refuse to fly on this death trap. Then carriers will refuse to buy the 737 Max and demand hundreds of billions in refunds for the hundreds of defective 737 Maxes already in their inventories. Then Boeing will no longer exist. Boeing will go bankrupt. That is how badly the Max was designed. It is a deadly design that not only kills people – it is a financial death trap that will kill the entire Boeing corporation. At this point, Boeing executives have made so many fatal errors that there is no longer any way to stop this series of deadly events.

In this article, we will explain a few of the most important errors that led to the death of not only hundreds of people – but the death of one of the world's oldest plane makers. We will explain why the Boeing 737 Max is likely the most dangerous commercial airplane ever produced. Barely two years after it was introduced, there have been two horrific crashes that killed a total of 346 people. So much for the Introduction. Now for the deadly details. We will go over the financial collapse facts later in this report. First, we will review the technical collapse – the unfixable design problems - that led to the 737 Max, doomed hundreds of people to a horrible death and soon will doom Boeing itself.

2 The Biggest Lie about MCAS

Most articles on the two Boeing 737 Max plane crashes have only scratched the surface of what happened or why these two planes crashed in nearly identical death dives. The corporate media would have you believe that some out of control computer programmer at Boeing wrote a bad software program called MCAS. This software programmer was so dumb that he or she failed to anticipate that the program might get a bad reading from a defective Angle of Attack (AOA) sensor located at the front of the 737 Max (as we will explain below, these sensors have been giving bad readings for years and everyone other than the public knew about it).

But back to the “simple” story told by the corporate media. MCAS was intended to keep the nose of the plane from going so high that it would stall. But instead of MCAS pushing the nose back down into a safe, level position, MCAS was badly written by our villain - the crazy computer programmer. MCAS went haywire and took over control of both planes – forcing both of them into a steep dive – causing them to crash into either the ocean or the desert. End of story.

According to this story, all Boeing needs to do is to have wiser computer programmers make the MCAS program less aggressive with a software patch. Boeing will then explain to pilots how MCAS works (especially how to turn MCAS off if it goes berserk again). Boeing will also use two of these unreliable sensors instead of only one - and the problem will be solved.

To reassure the public that the 737 Max is safe, the FAA will require Boeing and their highly experienced pilots to fly the 737 Max more than 100 times with this new patch. These test flights will not crash because these experienced pilots will stay below the deadly angle of attack. The FAA will then rubber stamp their approval of the new MCAS program just like they did with the old MCAS program. As they say in the Mafia, the fix is already in. Passengers will then be lured back into flying on this unstable plane - – at least until the next 737 Max crash in a ball of fire. But if you want to know the truth about how to protect yourself and your loved ones from a horrific death, then keep reading. You are in for a real shock. I am sure that by the end of this report, you will agree that another 737 Max crash is inevitable.

The first question that is rarely asked by the corporate media (or if it is asked is only superficially answered) is why the Boeing 737 Max needed the deadly MCAS program in the first place?

This important question is typically brushed off with a couple of sentences about how the new engines were too big to fit under the wings and so the engines had to be moved forward and up a few inches. Moving the engines caused the nose of the plane to rise too much – which might lead to a stall and loss of control of the plane. MCAS was added to “fix this problem” and prevent the nose from going too high.

All of these sentences have a grain of truth. But they are also hiding some rather ugly facts about the real origins and purpose of MCAS.

For example, did you know that moving such heavy engines that far forward and that far up had never been done before on any commercial airline in the history of aviation? Because this monster had never existed before, there was no way of accurately determining the effect this huge gamble would have. It was like going to Vegas and betting a trillion dollars (as well as hundreds of lives) on the roll of the dice – only to have the dice come up snake eyes. It is amazing how such an important detail is rarely if ever mentioned by the corporate media. Instead the press, the FAA and Boeing all act as if moving the engine one foot forward and one foot up on the airplane was no different than changing the seating arrangements to fit a few more seats on the plane.

We will later review the convoluted history of why and how such an extreme design change was needed. For now, all you need to know is that MCAS was created to address a problem whose true magnitude was not really known until the first prototypes of the 737 Max were flown in 2016. When Boeing learned that their gamble had come up snake eyes, there was so much money on the line that Boeing was forced to hide the truth from the FAA, from airline carriers and from airline pilots and even from their own test pilots. Boeing was boxed into a corner. They were forced to Double Down on MCAS. Boeing never intended to increase the power of MCAS from 0.6 degrees to 2.5 degrees. But they were FORCED to make this change. This is the important hidden back story that has not yet been revealed. This is the biggest lie about MCAS.

Why Boeing Lied to the FAA about MCAS

To see what really happened, let's take a closer look at one of the most shocking admissions by Boeing – that Boeing lied to the FAA and to Airline Carriers and to pilots about the real function and degree of control that MCAS was designed to use when taking over the 737 Max. Boeing initially hid MCAS entirely from air carriers and pilots. They also deliberately misled the FAA about MCAS.

Initially, from 2015 to November 2018 (one full month after the Indonesian Crash), Boeing told the FAA that MCAS was merely an optional feature that, if it was ever triggered, would only change the angle of the airplane stabilizer (also known as the tail wing flaps) by less than one degree – specifically **0.6 degrees**. This was described in a now infamous 2015 report to the FAA written by Boeing and called the **System Safety Analysis for MCAS**. This document, written by Boeing as part of the FAA Certification process, has never been shared with the public. But it has been described in several reports.

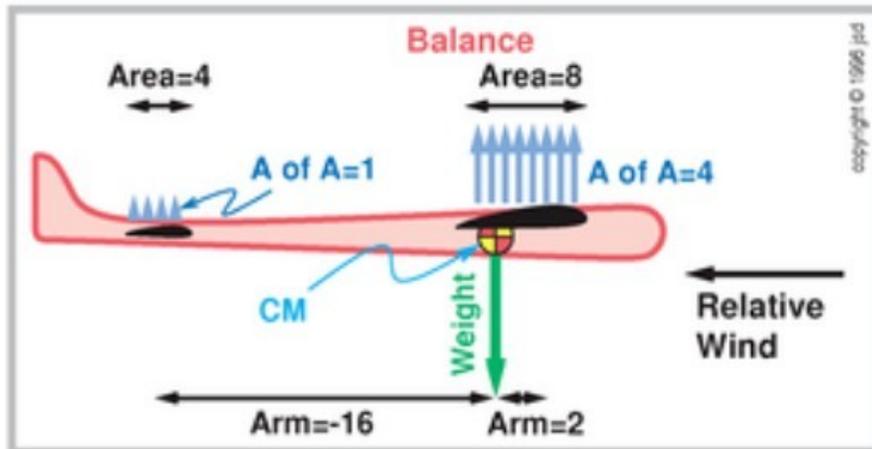
To the public, 0.6 degrees does not sound like much. But someone at the FAA either knew or should have known that tail wing flaps exert a huge level arm effect on the rest of the airplane. This means that a very small change at the back of the plane can result in a very large change at the front of the plane. Understanding this lever arm effect is crucial to understanding why the pilots of the two 737 Max planes were not able to stop the planes from crashing despite their best efforts.

A better way to look at the 0.6 degree change made by MCAS is to compare it to the maximum possible change of the tail wing flap – which is 5 degrees. A 5 degree change in the stabilizer or tail wing flap is capable of causing the plane to go in a steep 40 degree dive because the lever arm is about 8 to 1.

This is why both 737 Maxes were at a 40 degree nose down angle when they crashed. It is likely that the stabilizer tail flaps for both planes were forced into the maximum 5 degree nose down position by their malfunctioning MCAS systems when they crashed. MCAS mis- setting of the tail flaps combined with this 8 to 1 lever arm is what ultimately caused both crashes.

Below is a crude drawing which attempts to show how small changes in the very back of the plane can have huge effects at the front of the plane due to this 8 to 1 lever arm.

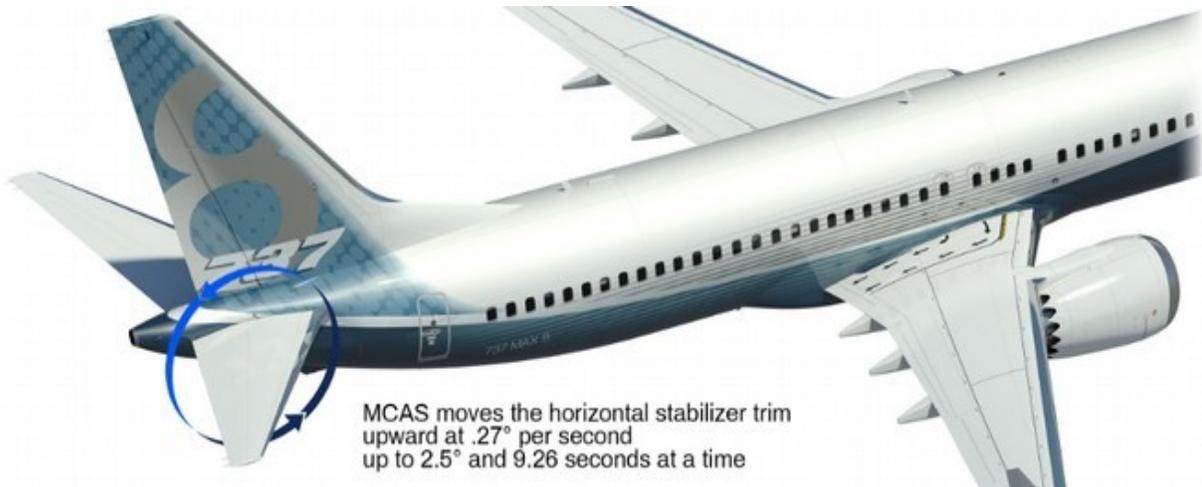
The green downward pointing arrow is the all important Center of Gravity of the plane. Think of the wings of this plane as the center of a teeter totter which has a very long end on one side – the tail. A very small change or push up of 5 degrees on the tail of the plane can cause a very steep 40% dive at the nose of the above plane.



Therefore, when Boeing told the FAA that MCAS would only change the back flap by 0.6 degrees, what they were really saying was that **MCAS would lower the nose of the plane by 8 times 0.6 degrees or 4.8 degrees**. Put more simply, each time MCAS was automatically activated, the plane would automatically take about a 5 degree nose dive. This at least was the initial plan.

The initial MCAS plan was dangerous enough. But Boeing next did something almost unspeakably dangerous. In 2016, when the first 737 Max was produced and subjected to testing, Boeing learned that the actual 737 Max was much more unstable than its designers had initially predicted. According to Wikipedia, the first 737 Max performed its first flight on January 29, 2016. These early Boeing test flights of the first four 737 Max planes in 2016 revealed that the new 737 Max was much more unstable than original estimates that Boeing had provided to the FAA in a 2015 report. It is stunning that the 0.6 degrees of adjustment originally planned for MCAS would not be enough. **Boeing therefore increased the MCAS adjustment from 0.6 degrees to 2.5 degrees** – about four times more than the original estimate given to the FAA. Ask yourself: Why did Boeing not just change MCAS to 1 degree or 2 degrees?

Once again, the public is being misled as 2.5 degrees would not seem to be that much. But the public is used to thinking in terms of a 360 degree circle. Instead, you need to think in terms of the 8 to 1 lever arm that the change in the tail flap has on the front of the plane. A 2.5 degree change in the back flaps (at a rate of one degree every four seconds) will change the angle in the front of the plane by 8 times 2.5 degrees or 20 degrees. This 20 degree change occurs over a period of just under 10 seconds. This is a huge and shocking change for any airplane.



Here is the description from a March 17 2019 Seattle Times article about the 2015 Boeing report called the **System Safety Analysis for MCAS**:

“The original Boeing document provided to the FAA included a description specifying a limit to how much the system could move the horizontal tail — a limit of 0.6 degrees, out of a physical maximum of just less than 5 degrees of nose-down movement.... **That (MCAS) limit was later increased after flight tests showed that a more powerful movement of the tail was required to avert a high-speed stall**, when the plane is in danger of losing lift and spiraling down... After the Lion Air Flight 610 crash, Boeing for the first time provided to airlines details about MCAS. Boeing’s bulletin to the airlines stated that the limit of MCAS’s command was 2.5 degrees...That number was new to FAA engineers who had seen 0.6 degrees in the safety assessment.”

“The FAA believed the airplane was designed to the 0.6 limit, and that’s what the foreign regulatory authorities thought, too,” said an FAA engineer. “The numbers should match whatever design was tested and fielded.”

“The former FAA safety engineer who worked on the MAX certification, and a former Boeing flight controls engineer who worked on the MAX as an authorized representative of the FAA, both said that such safety analyses are required to be updated to reflect the most accurate aircraft information following flight tests.”

<https://www.seattletimes.com/business/boeing-aerospace/failed-certification-faa-missed-safety-issues-in-the-737-max-system-implicated-in-the-lion-air-crash/>

A later article added that even the Boeing test pilots who tested the 737 Max in 2016 were never told about the increase in the power of MCAS from 0.6 degrees to 2.5 degrees. This raises the likelihood that the more powerful MCAS system was never subjected to adequate field testing before the first commercial 737 Max was shoved out the door in the middle of 2017. It is also likely that due to the rush to make the 737 Max, that neither the new engine placement or the new more powerful MCAS system were ever tested in a wind tunnel. It is also likely that Boeing never updated their **System Safety Analysis for MCAS – as was required by law.** In short, the 737 Max was certified under false pretenses.

The MCAS Monster is turned into an Infinite Loop

The FAA, Airline Carriers and pilots were also never told that an Infinite Loop repeating function had been added to MCAS sometime after the System Safety Analysis for MCAS was provided by Boeing to the FAA in 2015.

Boeing was so concerned about the extreme instability of the 737 Max that they also added an infinite loop repeat function to MCAS – forcing MCAS to repeat the 2.5 degree nose drop every ten seconds. With the Indonesian crash, this MCAS fatal loop repeated 11 times before the plane crashed. The Ethiopian plane was subjected to 5 cycles of this stupidity before it dived into the desert.

MCAS will nose drive to 10 seconds and then pause for 5 seconds and then repeat the 2.5 degree nose dive process. Thus, in **as little as 25 seconds a 737 Max – by design - can go from a normal level flying position to a 40 degree death dive.**

On July 5 2017, not knowing any of these facts about MCAS, the FAA certified the Boeing 737 Max including MCAS in the following legal document:

https://www.faa.gov/aircraft/draft_docs/media/afx/FSBR_B737_Rev17_draft.pdf

This document was then updated on April 17 2019 – apparently as a backdoor certification of the revised MCAS settings. Here is a quote from this document:

“The purpose of this revision is to add the B-737-7, B-737-8200, and Maneuvering Characteristics Augmentation System (MCAS). In Appendix 3, the Design Differences Table from the Boeing 737-800 to the Boeing 737-8 is revised to include ATA 27 Flight Controls addition of MCAS... The evaluation was conducted during August 2016... In March 2019, the FSB conducted an evaluation of the modified Maneuvering Characteristics Augmentation System (MCAS) for training and checking differences determination. The system enhancement is incorporated on all MAX series aircraft. The MCAS system was found to be operationally suitable.”

This FAA report is a prime example of FAA rubber stamping whatever Boeing wants.

Why the FAA had to be kept in the dark about the more powerful MCAS

There is no way the FAA would have approved such a powerful new MCAS device had they known about it in 2016. There is no way any airline carrier would have bought such an unstable plane had they known about it. This is why Boeing had to keep this new more powerful MCAS program a secret. This is why Boeing never told the FAA about the change in MCAS until November 2018 - a full month after the Indonesian crash.

How Pilots were kept in the dark

A pilot for a US airline told managers months before October’s Lion Air crash in Indonesia that he was uncomfortable with the level of training he had received before he was scheduled to fly the Boeing 737 Max for the first time. But when he asked for more training, he faced difficulties in getting it—and even a form of reprimand. Like pilots at other US airlines using the 737 Max—which has been involved in two deadly crashes in less than five months that have killed nearly 350 people—this pilot was only required by the US Federal Aviation Administration (FAA) to take a two hour video tutorial on the new jet, as he was already certified to fly earlier variants of the 737 aircraft, on which the Max is based. This video tutorial did not even mention MCAS.

“The video tutorial assigned to pilots before the Lion Air crash did not cover a new anti-stall flight system capable of sharply pointing the plane downward, whose role was highlighted in the preliminary investigation of that crash.”

<https://qz.com/1584233/boeing-737-max-what-happened-when-one-us-pilot-asked-for-more-training/>

The pilot told his superiors he wasn't comfortable flying the plane and requested simulator training. “I was going to see the airplane for the first time 45 minutes before departure, and have 45 minutes to adjust to this new aircraft, after which I was going to have 189 people in the back that I was responsible for,” he said. “So I filed a report with the company that I'm not comfortable flying as a pilot in command of this.”

His simulator request was denied as the carrier didn't have simulators for the Max—even now, [few airlines have Max simulators ready for training](#). A request to fly with an instructor the first time was also denied initially. Eventually, after a 45-minute conversation with the head of the airline's 737 training department, he said the airline agreed that he could fly with an instructor on his first Max flight, which was scheduled for July between two US west coast cities.

“When we arrived in Los Angeles there was no instructor and so I called the flight duty manager to ask where the instructor was and he said he'd call back,” said the pilot. A few minutes later his chief pilot called him to say that he was off the trip if he was unwilling to fly.

“I was punished not just from being taken off the trip and having the pay subtracted from me but by having a ‘missed trip’ put in my schedule, which is the same as same as not showing up for the trip,” he said. “I've never had a missed trip and I was shocked that even though I was sitting in the seat in the airplane when I was taken off the trip, that I was given a missed trip.”

The missed trip amounted to about \$3,000 in lost pay, as well as being a black mark on his record of reliability. He raised the issue with the union, and filed

reports internally and with the FAA. As information about his experience percolated to other pilots, several told him they had shared his concerns on training for the Max. “After this happened it became pretty well known, and since then I’ve probably had, I’m going to guess, 50 pilots speak to me,” he said.

The video tutorial assigned to pilots before the Lion Air crash did not cover a new anti-stall flight system capable of sharply pointing the plane downward. That system is called the Maneuvering Characteristics Augmentation System, or MCAS, for short. Another vital change linked to the new system—that a control column to counteract such maneuvers would no longer work as it used to—was also not communicated to pilots.

The pilot said his concerns about the 737 Max—which he eventually flew for the first time only in December, less than two months after the Lion Air crash, with an instructor who had also previously not flown the aircraft either—deepened after the Ethiopian disaster.

“I assume every 737 pilot in the world was briefed extensively after the Lion Air crash” to deal with automatic nose-down maneuvers by the flight system, he said. “So I kind of harbor a secret concern that **maybe there’s something bigger than this and maybe just turning off [switches to override MCAS] isn’t going to fix the problem.** I hope that’s not correct, I hope it will, but part of me says that it’s bigger than that and it’s not going to work.”

The Wall Street Journal reported this week that black-box data shows the Ethiopian pilots [had carried out steps](#) recommended by Boeing and the FAA in the wake of the Lion Air crash. But they were unable to get the plane to climb again, and appear to have reversed some of them. The plane crashed six minutes after takeoff.

Separately, a NASA-run database of confidential safety reports from US pilots recorded complaints from at least two pilots who flew the Max who said that they experienced the plane’s nose pitching down when they were in autopilot, which they were able to stop by shutting off autopilot. However MCAS is not supposed to activate when pilots are in autopilot mode—only when they are in manual flight mode. Boeing said it could not comment on those reports.

[According to Reuters](#), the doomed Lion Air cockpit voice recorder revealed how pilots scoured a manual in a losing battle to figure out why they were hurtling down to sea.

Boeing didn't tell Southwest Airlines and other carriers when they began flying its 737 MAX jets that a safety feature found on earlier models that warns pilots about malfunctioning sensors had been deactivated, according to government and industry officials. Here is a statement from Southwest Airline issued on April 28 2019:

“Upon delivery (prior to the Lion Air event), the AOA Disagree lights were depicted to us by Boeing as operable on all MAX aircraft, regardless of the selection of optional AOA Indicators on the Primary Flight Display (PFD). The manual documentation presented by Boeing at Southwest’s MAX entry into service indicated the AOA Disagree Light functioned on the aircraft, similar to the Lights on our NG series. After the Lion Air event, Boeing notified us that the AOA Disagree Lights were inoperable without the optional AOA Indicators on the MAX aircraft. At that time, Southwest installed the AOA Indicators on the PFD, resulting in the activation of the AOA Disagree lights - both items now serve as an additional crosscheck on all MAX aircraft.”

Southwest’s cockpit crews and management didn’t know about the change for more than a year after the planes went into service. They and most other airlines operating the Max globally learned about it only after the fatal Lion Air crash last year led to scrutiny of the plane’s revised design. “Southwest’s own manuals were wrong” about the status of the alerts, said Southwest pilots union president, Jon Weeks. Since Boeing hadn’t communicated the modification to the carrier, the manuals still reflected incorrect information.

The FAA did not respond to a query on whether, prior to the Lion Air crash, US pilots had expressed concern to the regulator about the level of training they had received on the Max.

Did Boeing Turn off Pilot Access to an Essential Safety Feature?

Boeing clearly wanted MCAS to run as a secret and independent process to prevent what Boeing correctly interpreted as a huge and dangerous risk of a 737 Max nose up stall. However, according to a shocking report from the Seattle Times, Boeing may have inadvertently changed the Controls of a crucial “auto-disable” switch in the cockpit of the 737 Max. I have not been able to find any other report to confirm the claims made in this Seattle Times article and I have a hard time believing this claim is true. If it is true, then it borders on criminal negligence. Here is a picture of the switches that Boeing may have altered:

Stab Trim Cut-Out Switches



Here is the claim made by the Seattle Times: “In the middle of Boeing 737 cockpits, sitting between the pilot seats, are two toggle switches that can immediately shut off power to the systems that control the angle of the plane’s horizontal tail. Those switches are critical in the event a malfunction causes movements that the pilots don’t want. And Boeing sees the toggles as a vital backstop to a new safety system on the 737 MAX – the Maneuvering Characteristics Augmentation System (MCAS) – which is suspected of repeatedly moving the horizontal tails on the Lion Air and Ethiopian Airlines flights that crashed and killed a total of 346 people. But as Boeing was transitioning from its 737 NG model to the 737 MAX, the company altered the labeling and the purpose of those two switches. The functionality of the switches became more restrictive on the MAX than on previous models, closing out an option that could conceivably have helped the pilots in the Ethiopian Airlines flight regain control.

Boeing declined to detail the specific functionality of the two switches. But after obtaining and reviewing flight manual documents, The Seattle Times found that the left switch on the 737 NG model is capable of deactivating the buttons on the yoke that pilots regularly press with their thumb to control the horizontal stabilizer. The right switch on the 737 NG was labeled “AUTO PILOT” and is capable of deactivating just the automated controls of the stabilizer.

On the newer 737 MAX, according to documents reviewed by The Times, those two switches were changed to perform the same function – flipping either one of them would turn off all electric controls of the stabilizer. That means there is no longer an option to turn off automated functions – such as MCAS – without also turning off the thumb buttons the pilots would normally use to control the stabilizer.

Peter Lemme, a former Boeing flight-controls engineer who has been closely scrutinizing the MAX design and first raised questions about the switches on his blog, said he doesn't understand why Boeing abandoned the old setup. He said if the company had maintained the switch design from the 737 NG, Boeing could have instructed pilots after the Lion Air crash last year to simply flip the “AUTO PILOT” switch to deactivate MCAS and continue flying with the normal trim buttons on the control wheel. He said that would have saved the Ethiopian Airlines plane and the 157 people on board.”

The Seattle Times article is behind a pay wall. Here is a link to an article discussing this claim that is not behind a pay wall:

<https://www.nakedcapitalism.com/2019/05/how-deep-is-boeings-hole.html>

If this claim turns out to be true, then some people at Boeing should go to jail. I disagree that members of the FAA should go to jail because they were in fact kept in the dark for years about the true power of MCAS.

[Federal Aviation Administration](#) safety inspectors and supervisors were also unaware of the MCAS change.

Boeing had a trillion dollars in reasons for keeping the FAA, pilots and airlines in the dark about MCAS. Boeing and the FAA and their airline partners are still keeping the public in the dark about the 737 Max.

We now know that the jack screws from the horizontal tail stabilizer were recovered from both crashes. Both jack screws showed that the planes had been oriented in a full 40 degree dive position with the nose pointing down.

A “screw-like device” found at the scene of the deadly Ethiopian Airlines crash indicates the plane was “configured in a nose dive” when it hit the ground, killing all 157 people on board, Bloomberg News reports. On Thursday, Daniel Elwell, the Federal Aviation Administration’s acting chief, said evidence found at the scene of the disaster led to the US. decision to ground Boeing 737 Max 8 and 9 series planes. “The piece of evidence was a so-called jack screw, used to set the trim that raises and lowers the plane’s nose,” Bloomberg News reports, quoting an unnamed source close to the investigation.

<https://www.bloomberg.com/news/articles/2019-03-15/piece-found-in-crash-wreckage-said-to-show-jet-was-set-to-dive?srnd=premium>



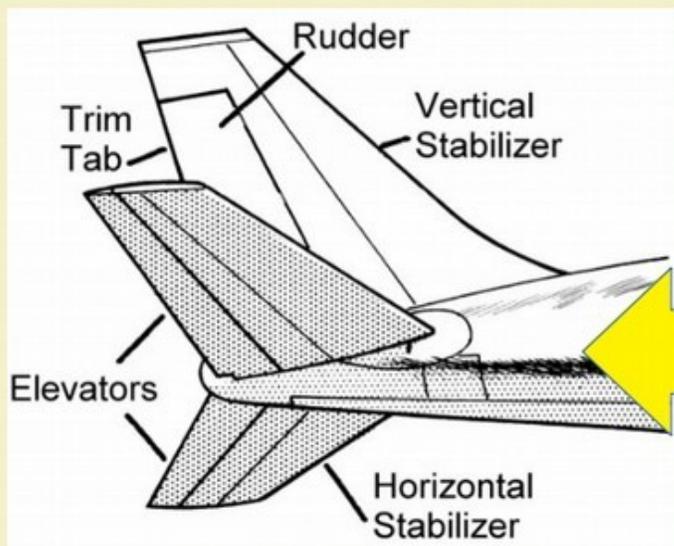
Somewhere in this mess, investigators found the Jack screw which was in a full 40 degree nose down position.

Here is a quote about the Indonesian descent angle:

The [last ADS-B data](#) that we have from Flightradar24 has the aircraft at an altitude of 425 ft, a ground speed of about 360 knots, and a descent rate of 30,976 fpm. That translates to an approximate true airspeed of 472 knots and a descent angle of about 40 degrees.

<http://mh370.radiantphysics.com/2018/11/04/crash-debris-from-lion-air-jt610-provides-clues-about-mh370/>

The Jack Screws of both planes were found and confirmed To be in a full 40 degree nose down position.



The Jack Screw is a cable from the Cockpit which Moves the Horizontal Stabilizer up Or down

Note that when the horizontal stabilizer is pushed up the maximum of 5 degrees, the nose will be pushed down 40 degrees due to an 8 to 1 lever arm. It takes MCAS about 25 seconds to push the jack screw enough to move the stabilizer up 5 degrees – moving the nose down 40 degrees. MCAS had done the job it was intended to do. It had prevented the 737 Max from going into a nose up stall. Sadly, MCAS also put the nose into a 40 degree nose down death dive.

3 Why Boeing only used one Angle of Attack AOA Sensor

One of the primary changes being made by Boeing is to link two Angle of Attack sensors to MCAS. This will do nothing to change the fact that the engines of the 737 Max are in the wrong place. Even the head of the FAA agrees that the Angle of Attack Sensor problem was not the primary cause of the two 737 Max plane crashes. In a Congressional hearing on May 15, 2019, during questions about why the FAA concluded that the angle-of-attack sensor disagree light wasn't critical to safety, FAA head Elwell claimed that the disagree light is only needed for maintenance purposes:

Question: "Should the AOA disagree light be a required feature?"

FAA acting chief Daniel Elwell: "No. It is just a maintenance alert. The AOA disagree light is only a service advisory. **The AOA disagree light would not have changed the outcome of either accident.** "

His statement seems hard to understand given that a defective AOA sensor was clearly involved in at least one and likely both of the 737 Max crashes. While there are two AOA sensors on all Boeing 737 Max planes (and have been ever since the first test flights in the spring of 2016), only one of these sensors is actively connected to MCAS – the sensor on the pilot side of the plane. Here is what the AOA sensors looks like on a 737 Max:



Here is a close up view of one of these sensors:



The AOA sensor is a small wing that can rotate and read the difference between the reference angle of the planes forward motion and the angle of the wind which is assumed to be the same as wind angle at the wing.

It should be noted that the Airbus A320 uses three AOA sensors – two similar to the Boeing AOA indicators but made by a more reliable manufacturer – and one under the tail of the plane. Some reports have indicated that Boeing cannot add a third angle of attack sensor under the tail of the plane do to design problems. But I was unable to find a clear explanation of what those design problems were.

However, the chief benefit of the Airbus A320 is not the three AOA sensors or the fact that they are using a better AOA sensor supplier with a better track record. The benefit of the A320 Neo is that the engine was properly placed on the plane to avoid excessive nose lift. The lack of excessive nose lift (a better balanced plane) means that the Airbus A320 Neo is much less likely to need the AOA sensors in the first place – no matter how many there are of them.

But returning to the question we are considering in this section, we need to ask why Boeing deliberately chose to use one sensor instead of two sensors and why Boeing chose to make the Sensor Difference Light in the cockpit of the 737 Max an optional feature?

The answer appears to be that Boeing concluded that the additional light would confuse pilots more than it would help them. An alternate explanation is that Boeing was simply trying to hide MCAS from the FAA, from pilots and from airline carriers.

Giving Boeing the benefit of the doubt, let's review why using the readings from two AOA sensors instead of one might confuse pilots and increase the chances of a crash.

First, the proper response to a difference in AOA sensor readings is to turn off MCAS and not use it at all. As we explain in a later section, test engineers in 2016 clearly believed that an aggressive MCAS was needed to prevent a stall. Therefore, they viewed the risk of turning off MCAS as being greater than the danger from an inaccurate AOA sensor.

Second, if the pilot is in a whiteout, it would be very difficult for an inexperienced pilot to tell which sensor was right and which one was wrong.

Third, some circumstances such as icing and strong winds can affect both sensors and cause both of them to have erroneous readings.

We do not know what was going through the minds of the Boeing engineers when they decided that one sensor was safer than two sensors in 2016. But what we can know is that these Boeing engineers were not idiots. They instead were clearly very concerned about the danger that using two sensors would increase the odds of pilots turning off MCAS and then getting into a stall.

Due to the bad press Boeing has gotten from the two nose dive crashes, they have reversed course. They will now use two sensors instead of one (although the details of how these two sensors will be used has not yet been released). Nor has Boeing ever released the complete analysis their engineers must have conducted when they first decided that one sensor was safer than two sensors.

But we cannot assume that two sensors will be any safer than one sensor. They should reduce the odds of a Boeing 737 Max crashing from an extreme nose dive. But as we show later, they will also increase the chances of a Boeing 737 Max crashing from a Nose Up Stall.

It gets worse: over the last five years, [50 flights](#) on US commercial airplanes experienced AoA sensor issues, compared to an estimated [76.8 million](#) flights in US airspace in the same time frame. That is six times above the maximum rate set by the FAA for "hazardous" systems. This elevated risk of failure is why few commercial airliners make flight-critical decisions [based solely on](#) AoA sensor inputs.

The FAA reports include 19 reported cases of sensor trouble on Boeing aircraft, such as an American Airlines flight in 2018 that declared a mid flight emergency when the plane's stall-warning system went off, despite normal airspeed. The Boeing 737-800 landed safely. Maintenance crews replaced three parts, including the angle-of-attack sensor, according to the FAA database.

In 2017, an American Airlines-operated Boeing 767 headed to Zurich declared an emergency and returned to New York. Another angle-of-attack sensor was replaced. And an American Airlines 767 was forced to return to Miami in 2014 after a mid flight emergency because of a faulty angle-of-attack sensor.

Adding another sensor is ignoring the real problem – just as changing MCAS from 2.5 degrees to 1.5 degrees (or whatever) is ignoring the real problem. What is needed is not more faulty sensors or a different MCAS setting. Rather we need planes that are designed to be stable so that AOA sensors are activated less often. This means insisting that planes are aerodynamically sound with the engines in the right place in relationship not only to the center of gravity but also in relationship to the wings of the airplane.

4 Why the Plan to Reduce the Power of MCAS will lead to more crashes

“The overriding problem is the basic unstable design of the 737 Max. An aircraft has to be stall proof not stall prone.” Ralph Nader

Boeing and the FAA have been extremely secretive about what their solution to the MCAS problem will be. All that Boeing has said was that they would have a software fix that would do four things:

First, they will increase the number of sensors from only using one sensor to using two sensors. This change will do nothing about the real problem – the instability problem - created when Boeing moved the new engines forward and up.

Second, the software fix will reduce the power of MCAS to push the nose of the plane down. This change will also do nothing about the real problem – the instability problem - created by moving the new engines forward and up.

Third, the software fix will eliminate the infinite loop problem of MCAS reactivating itself repeatedly. This change will also do nothing about the real problem – the instability problem - created by moving the new engines forward and up.

Fourth, Boeing will do a better job of explaining to pilots how they can turn MCAS off. This change will also do nothing about the real problem – the instability problem - created by moving the new engines forward and up.

Problem Solving 101 – Identify the Underlying Cause of the Problem

In order to solve any problem, it is important to focus on the underlying cause of the problem. The underlying problem of the Boeing 737 Max is that moving the large and powerful new engines too far forward in front of the wings and too high up in front of the wings caused the 737 Max to have an extreme tendency to have the nose of the plane tip up too high. This extreme nose up position is just as dangerous as an extreme nose down position because extreme nose up can lead to a stall and loss of control of the airplane just as extreme nose down can lead to a dive and loss of control of the airplane.



The reason stalling an airplane as large as a 737 Max is dangerous is that there are huge forces involved. There are also Positive Feedback Loops involved. This means that once the nose of any airplane (not just the 737 Max) gets too high (near a stall angle), the nose will start to rise even faster making the stall much worse and lead to a very rapid loss of control of the airplane. Bigger faster planes present exponentially greater surface areas making stall recovery much more difficult. The whole point of a stable airplane design is that the plane should be aerodynamically stable. The plane should be naturally balanced around its center of gravity and should not require a highly experienced pilot in order to avoid stalling.

Designing commercial airplanes to be aerodynamically stable is not merely a good idea. It is a federal law. Here is the stall regulation that Boeing violated when they moved the engines of the 737 Max too far forward and too far up:

14 CFR §25.203 Stall characteristics.

(a) It must be possible to produce and to correct roll and yaw by unreversed use of the aileron and rudder controls, up to the time the airplane is stalled. No abnormal nose-up pitching may occur. The longitudinal control force must be positive up to and throughout the stall. In addition, it must be possible to promptly prevent stalling and to recover from a stall by normal use of controls.

(b) For level wing stalls, the roll occurring between the stall and the completion of the recovery may not exceed approximately 20 degrees.

Title 14 is the section on FAA Airplane Standards. Part 25 is the Airworthiness Standards for commercial planes. Section 203 is the law intended to prevent and recover from stalls. The stall prevention and recovery test – a test that must be conducted on any new plane – and therefore must have been conducted on the 737 Max in 2016 – is described in this document:

<https://www.govinfo.gov/content/pkg/CFR-2010-title14-vol1/pdf/CFR-2010-title14-vol1-sec25-203.pdf>

Moreover because MCAS is also an automatic power operated stability augmentation system, it is also subject to these two federal laws which Boeing also broke:

14 CFR §25.671 General Control System Requirements

(c) The airplane must be shown by analysis, tests, or both, to be capable of continued safe flight and landing after any of the following failures in the flight control system and surfaces (including trim, lift, drag, and feel systems), within the normal flight envelope, without requiring exceptional piloting skill or strength.

14 CFR §25.672 Stability augmentation and automatic and power operated systems

If the functioning of stability augmentation or other automatic or power-operated systems is necessary to show compliance with the flight characteristics requirements of this part, such systems must comply with §25.671 and the following:

(a) A warning which is clearly distinguishable to the pilot under expected flight conditions without requiring his attention must be provided for any failure in the stability augmentation system or in any other automatic or power-operated system which could result in an unsafe condition if the pilot were not aware of the failure. Warning systems must not activate the control systems.

(b) The design of the stability augmentation system or of any other automatic or power-operated system must permit initial counteraction of failures of the type specified in §25.671(c) without requiring exceptional pilot skill or strength, by either the deactivation of the system, or a failed portion thereof, or by overriding the failure by movement of the flight controls in the normal sense. https://ecfr.io/Title-14/pt14.1.25#se14.1.25_1672

Put in plain English, federal law prohibits Boeing from producing a plane with an extreme nose up tendency. Federal law also prohibits Boeing from producing an Augmentation System which cannot be counter acted by a normal pilot. Boeing was well aware of both laws – which is why the true power of MCAS had to be hidden from the FAA. The MCAS system was so well hidden from the FAA that a 30 page report by the FAA listing all of the new features of the 737 Max did not include a single reference to MCAS (see pages 64 to 94, Model 737-8 approved on March 8 2017). Page 88 states: **“Modifications that reduce flight critical system separation or adversely impact survivability of systems are not acceptable.”**

<http://www.b737.org.uk/a16we.pdf>



The design of the Boeing 737 Max clearly violates several federal laws. In the next section, we will take a closer look at how these crimes occurred.

5 What Happened during the 2016 737 Max Test Flights

The change in MCAS after the 2016 test flights from 0.6 degrees to 2.5 degrees is the smoking gun confirming that something must have occurred during these test flights which forced Boeing to make this radical change to MCAS. In this section, we will finally answer the question no one thus far has been able to answer: Why was such a radical change needed? How could Boeing engineers have made such a huge mis-calculation? The answer is turbulence – the most complex topic in all of physics. In this section, we will explain why even smart engineers might under-estimated the extreme effect that the turbulence of raising the engines one foot higher than it had been previously placed in the 737 NG would have on the 737 Max.

First, you need to understand that turbulence has been called the most important unsolved problem in physics. The American Nobel Prize Laureate for Physics Richard Feynman once described turbulence as “the most important unsolved problem of classical physics”, because an accurate mathematical equation of turbulence does not exist. We have quantum mechanical equations to describe the inner workings of the atom – but we do not have accurate equations for turbulence. In 2000, the Clay Mathematics Institute in Cambridge/ Massachusetts offered one million US dollars to any mathematician who could provide an accurate equation for turbulence. So far, no one in the world has been able to solve this problem. Note the sudden and chaotic expansion:



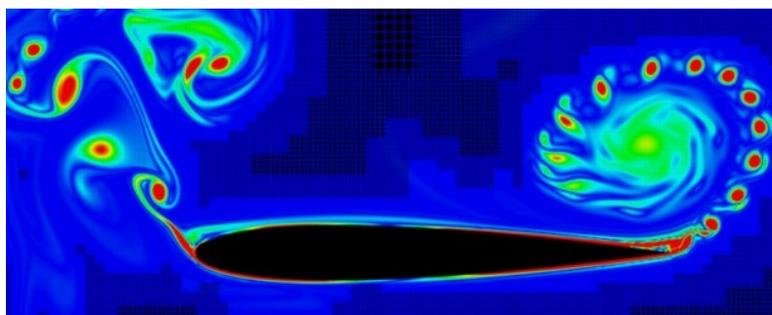
Even the inventor of Quantum Mechanics, and the winner of the 1932 Nobel Prize in Physics, Werner Heisenberg once said that if he were allowed to ask God two questions, they would be, “Why quantum mechanics? And why turbulence?” Heisenberg said he was pretty sure God would be able to answer the first question (implying that not even God can explain turbulence).

Given that not even God understands turbulence, it should not be too surprising that Boeing engineers might have under-estimated the adverse effect of turbulence when they designed the 737 Max.

There are two ways that engineers guard against turbulence. The first and most common way is to avoid turbulence as much as possible. This is why no previous version of the 737 had placed the engine so close to the top of the wing. Putting the engine at or above the wing would create unpredictable turbulence exactly where you do not want it – at the top of the all important wings where it might have huge and difficult to calculate effects such as pivoting the plane around the center of gravity.

Unfortunately, there was not enough room to put the new much bigger engines well under the wings – and Boeing executives insisted that the engine be moved up rather than redesign the entire plane to account for the bigger engines. So the engines were moved up about one foot – which as we will show later in this section, created a huge amount of turbulence right over the wings. **Strike #1.**

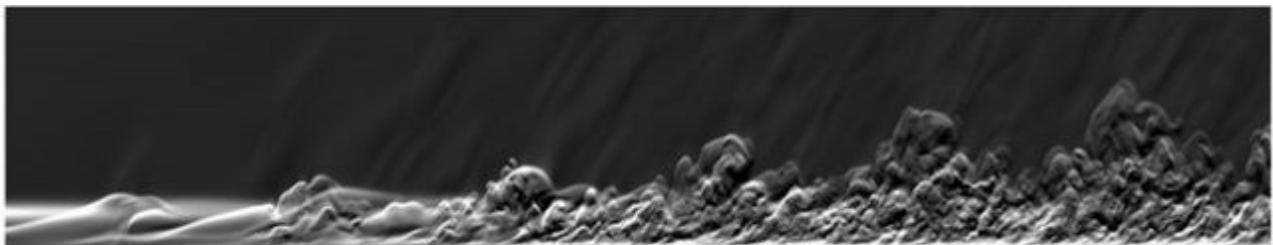
The second way to deal with turbulence is to build scale models and do wind tunnel testing. I have been unable to find any accounts of wing tunnel testing on the 737 max. Instead, what I have found is many accounts of Boeing executives insisting that development occur more rapidly because they were in a trillion dollar race with Airbus to produce a new airplane to compete with the Airbus A320 NEO (which did have room for the new engines under the wing). I therefore have concluded that either there was no wind tunnel testing at all – or if it did occur, it was not adequate. Instead, it is likely that Boeing engineers simply did computer simulations of lift and turbulence. Here is a picture of one of these simulations:



Based on these computer simulations, Boeing engineers simply estimated that the nose of the plane would rise slightly. They then came up with MCAS and a tail adjustment of 0.6 degrees as a solution to fix this problem. Strike #2.

Unfortunately computers have a difficult time predicting turbulence because all computers use equations. This is why the only good solution, besides avoiding turbulence, is to build scale models and do actual wind tunnel testing to simulate real world conditions like cross winds and icing on the wings.

It appears that Boeing simply took the initial drawings and built four actual 737 Max planes. These planes were completed in spring 2016 and then Boeing began doing real world test flights on a plane that had never existed before. At some point in the spring 2016, FAA regulations (which we quoted from in an earlier section) forced Boeing to do anti-stall maneuvers which placed the 737 Max at an angle of attack of nearly 20 degrees. As we will show in a moment, this angle of attack greatly increases the exposure of the new engines above the wings of the 737 Max - which then rapidly and unpredictably increases the turbulence just as the air flows over the center of gravity. The effect is a minor loss of lift in front of the center of gravity and a large loss of lift towards the tail of the plane – causing a huge pivot around the center of gravity and lifting the nose tremendously. Here is a picture from NASA showing how turbulence increases as it moves over a flat surface. Note the rapid increase from left to right:



Imagine the center of gravity of the 737 Max being somewhere in the middle of this picture and you can understand why this problem could fool not only Boeing engineers but also any computer models they were relying on. Capturing, and predicting, the transition to turbulence is an ongoing challenge for engineers, physicists, mathematicians and computer programmers. There are many theories and many models. But none of them are really accurate. They should never be used in the real world where hundreds of lives are at stake.

I believe that during the required stall recovery tests in the Spring of 2016, Boeing engineers realized for the first time that they had a major problem. An MCAS adjustment of 0.6 degrees in the tail flap (5 degree change at the nose of the plane) simply was not enough to prevent the 737 Max from going into a catastrophe out of control stall. In short, the 737 Max could not pass the FAA Anti-Stall stability test.

At the same time, Boeing corporate executives were insisting that the 737 Max pass all FAA required tests as soon as possible. There was a lot of pressure put on the engineers in the Spring of 2016 because billions of dollars were at stake. It is likely that Boeing engineers first tried to double MCAS from 0.6 degrees to 1.2 degrees (pushing the nose of the plane down 10 degrees). Here is a picture of all of the computer equipment that was inside of one of these initial test flights. The stability tests were conducted from February 2016 to June 2016. The picture was taken on June 28, 2016 around the time that the change in MCAS was made.



<http://www.b737.org.uk/maxfltttestprog.htm>

Sadly, even 1.2 degrees of MCAS was not enough to prevent the 737 Max from going into an uncontrollable stall. Engineers then likely tried 1.8 degrees of MCAS. This did not work either. Eventually, engineers were forced to move MCAS all the way up to 2.5 degrees at the tail (20 degrees at the nose). They were even forced to add a repeat function to insure that the 737 Max was able to pass the FAA anti-stall test. Put in plain English, the plane had such a huge tendency to go nose up that a huge adjustment was needed to avoid nose up.

So what will the new 2019 Boeing fix do by reducing the MCAS adjustment from what engineers felt was needed in June 2016? The answer is obvious. The new Boeing adjustment will reduce the chances of a nose dive by increasing the chances of a nose up stall – even though Boeing surely knows that stalling the 737 Max is just as likely to lead to loss of control of the airplane and crashing the airplane as a nose down dive.

It does not really matter if the new MCAS setting is limited to 1 degree or 2 degrees of adjustment instead of 2.5 degrees. When a plane is this unstable, you pick your poison. Do you want to die in a crash caused by nose down diving or nose up stalling? Either way, within months of starting to fly again, some hapless or poorly trained pilot will allow the 737 Max to get into a nose up position. It will stall and then crash. This is why I am so certain that the 737 Max will have a crash within a matter of months after it is rubber stamped to fly again by the FAA. But to better understand why stalls are so dangerous, we will next take a closer look at the narrow range of conditions needed to maintain a Stable Flight Envelope. If you do not like math, you may want to skip the rest of this section as things are about to get a little complicated.

What is Needed to Maintain a Flight Envelope

Most people have no idea what kind of complex forces are involved when a modern commercial airplane is flying at hundreds of miles an hour and carrying 200 people and all of their luggage in a plane that is half the length of a football field. Much of the process is not only automated, it is power driven using special hydraulic devices.

Imagine trying to turn or stop your car while driving at 70 MPH on the freeway. It is hard enough. Now imagine having to do this without power brakes and power steering. It is almost impossible. Now imagine multiplying all of these forces by a factor of 100 – that is what makes modern airplanes so complex.

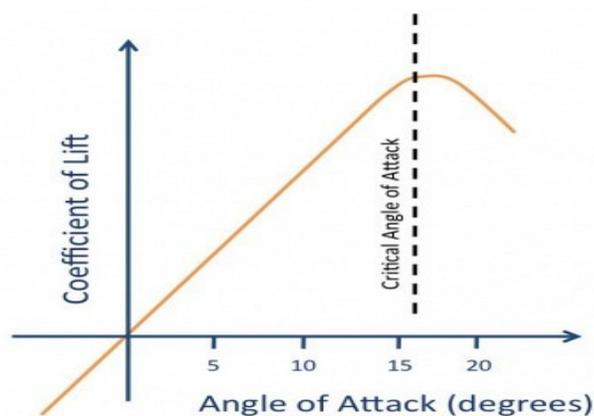
Add to this the problems of **lift versus turbulence** and the changing density of the air when ascending from sea level to 20,000 feet and what you get is a massive amount of complex equations and force vectors. From the moment a plane speeds up on the runway and takes off, to the moment it lands, it is subjected to a huge range of forces. These forces need to be kept inside a range of values called the Flight Envelope.

Understanding how Lift can suddenly change to Stall

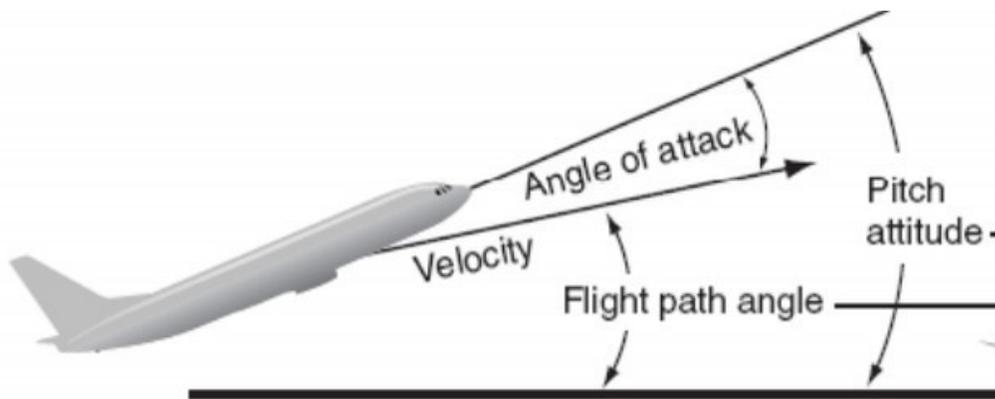
While these values change with speed and elevation, here we will only look at that part of the flight envelope needed to avoid stalling and the crucial effect of the angle of attack. There is a simple test you can do while driving your car down the freeway that will help you understand how rapidly lift can change to stall. Pretend your hand is the wing of an airplane. Stick your hand out the window of your car with your palm down and your hand level to the ground. Your hand is at a low angle of attack. Your hand does not go up or down because there is no lift. Next, tilt your hand a bit to expose a little of your palm to the wind. Suddenly, your hand wants to go up due to a force called lift. Finally, keep increasing the amount of your palm exposed to the wind. At first, the lift force will increase. But at some point, your hand will suddenly be forced to go down and may even smack into the side of your car due to the sudden change in force. Here is a picture of a child learning the difference between lift and stall:



Here is a graph of the sudden change from lift to stall as the angle of the wing in relationship to the airflow changes:



The danger of a plane stalling is at its greatest shortly after takeoff as the plane is trying to gain altitude – which means that the plane must be in a nose up position. The technical term for a nose up position is a positive angle of attack. This is not the same as the angle of the airplane compared to level ground. Instead it is the angle of the airplane compared to the angle of the wind going over the wing – which is in turned related to the flight path angle of the airplane in terms of its forward progress. Below is one of the best diagrams I have been able to find showing this difference:

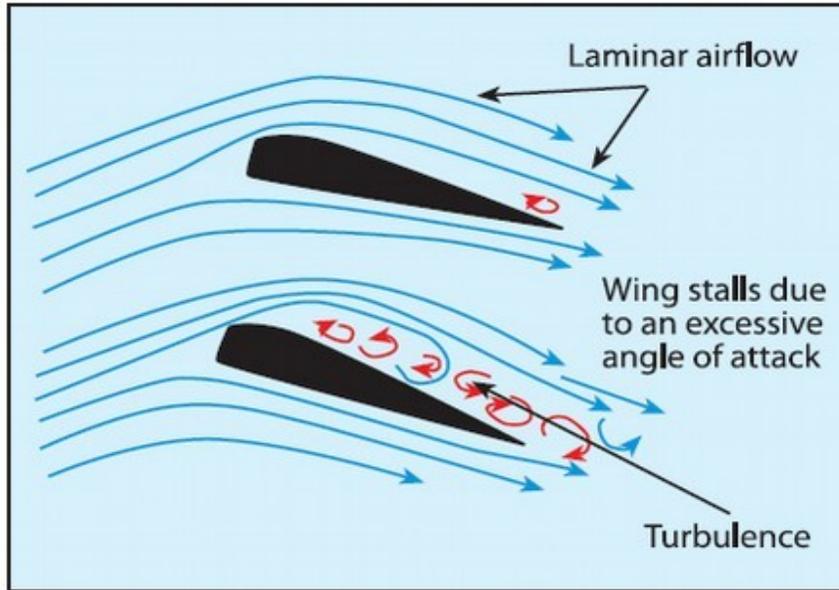


<http://www.alphasystemsaoa.com/assets/PDFs/articles/Angle-of-Attack-APS-Training.pdf>

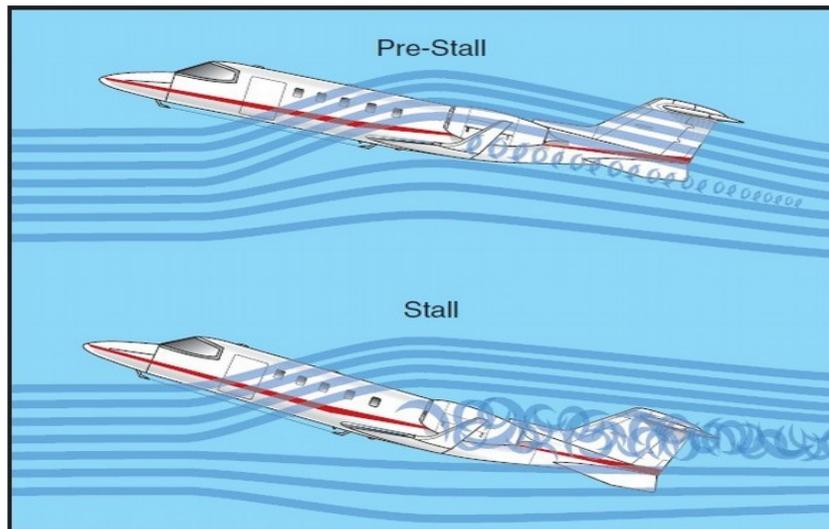
Note that the plane above, shortly after take off, is moving forward at the Flight Path Angle. But the plane is also tilted slightly above the Flight Path Angle. The angle between the plane and the ground is called the Pitch Angle. But what matters in terms of avoiding a stall is not the pitch angle. Rather what matters is **the Angle of Attack (AOA) which is the difference between Pitch Angle and the Flight Path Angle**. Note that the above diagram assumes that there is no wind and that the wind angle over the wing is therefore the same as the Flight Path Angle. Wind that is at a different angle from the Flight Path Angle reduces the margin of safety in the Flight Envelope.

The reason taking off is so difficult in terms of the danger of stalling is that up to a certain point, where the nose is up about 17 degrees, an airplane will get more lift if it has a higher angle of attack. Most airplanes come very close to 17% shortly after takeoff in order to gain altitude rapidly. However, **beyond 20%, the lift is suddenly lost and the airplane will spin and roll out of control.**

Note that maximum lift is achieved at an Angle of Attack of about 17 degrees. Beyond this value, lift is suddenly replaced by turbulence. Think of smooth air flowing over the wing as good but bouncy air flowing over the wing as bad. Here is a diagram showing the difference between good lift and bad turbulence.



Turbulence eliminates lift causing the plane to stall. Here is an example of lift versus stalling with the entire airplane in the picture:



So smooth airflow is good for lift and turbulent airflow is bad. This is basic physics. Unfortunately, Boeing went down a path that eventually caused it to ignore the laws of physics.

Why the 737 Max Engine was moved too far forward and too far up

The first 737 designed in 1965 was intended to have 100 seats and fly up to 1000 miles. To speed up design work, Boeing used 60% of the structure and systems of its previous 727. http://www.wikiwand.com/en/Boeing_737

Here is a bottom up picture showing the relationship of the engine to the wing in the original 737 produced in the 1970:



Above is the 737-200 produced in 1970. You can see that the two engines are almost directly under the two wings. In 1988, the production of 737-200 was ended after making 1,114 of planes of this model.

By 1979, as oil was becoming more expensive, it was becoming apparent that more efficient engines would require much more space in diameter compared to the previous engines. There was not enough room under the wing of the 737 for these bigger engines.

Boeing should have recognized in 1979 that the trend towards bigger diameter, high bypass engines would continue and therefore should have designed a plane that was much higher off the ground in 1979. But instead, Boeing did not want to invest in a new plane design. So they began making mistakes that would eventually lead to the 737 Max disaster.

Their first mistake in 1979 was to move the engine more in front of the wing.



They also moved parts of the engine to the side of the fan. This gave the 737-300 engine the appearance of a hamster pouch. Here is a picture of the forward mounted hamster pouch engines:



The first flight of the 737-300 (now called the 737 Classic) was February 24, 1984 and it was certified as safe by the FAA 6 months later. By 1990, Boeing for the first time faced competition from the Airbus A320 – a European made plane that was designed to be higher off the ground in order to accommodate a new generation of bigger engines.

Boeing therefore began to design a more fuel efficient version of the 737 called the 737- Next Generation or 737 – NG for short. The wing span was increased by 16 feet – increasing the area under the wing by 25%. The first 737-700NG was flown on July 31, 1997 and certified by the FAA in 1998. The 737-700NG had even flatter engine undersides than the 737-300.

Here is a picture of the bottom of the 737-700NG with the flat bottom engines:



Now let's look at the 737 Max with the big engines placed forward of the wing and above the wing compared to the previous 737 NG:



737 MAX vs NG Engine Placement and Size

Notice that the NG engine had also been moved forward and up compared to the 737 Classic. So the 737 NG was already slightly more unstable than the 737 Classic.

The 737 Max engine was moved about 12 more inches forward and about 12 more inches up. Both moves were bad because they both add lift and push the nose of the plane up. Remember that once the angle of attack is exceeded, the nose will start to pitch up even more – which leads to the out of control death spiral. Therefore in weakening MCAS, all Boeing is really doing is changing the 737 from a plane that has a tendency to go into a steep dive into a plane that has a tendency to stall. Either way, eventually another Boeing 737 Max is going to crash and when it does, it will be all over for Boeing.

Why moving the engine forward in front of the wing creates instability

On December 1, 2010, Airbus announced a new version of the A320 called the A320 NEO which would use a much bigger and more fuel efficient engine called the LEAP engine. The new LEAP 1A engines featured an 11 to 1 bypass instead of the previous 6 to 1 bypass ratio resulting in a 16% savings in fuel consumption. (the LEAP 1B engines used on the Boeing 737 Max has only a 9 to 1 bypass ratio due to a smaller diameter fan and therefore only a 12% savings on fuel consumption). However, this increase in fuel efficiency required the engines to be much larger in diameter than previous engines. As the following table shows, the diameter of the LEAP 1B engine is about 24 inches greater in height than the diameter of the engine used in the 737 NG.

Table of Boeing 737 Engine Increase in Diameter

Boeing Model	Year Certified	Engine	Fan Diameter (inches)	HT - Engine Diameter	Engine Ground Clearance
737 100 - 200	1967	P & W JT8D	49	60	17 to 20 inches
737 Classic	1984	CFM56 - 3	60	71 Hamster	15 to 18 inches
Airbus A320	1987	CFM56 - 5	68	89	24 inches
737 NG	1998	CFM56 - 7	61	72 Hamster	15 to 18 inches
737 Max	2017	CFM – LEAP 1B	69	89	15 to 17 inches
Airbus A320 NEO	2016	CFM – LEAP 1A	78	96	18 inches

Note 1: According to this 2005 document, the Boeing 737 NG Engines were only 15 to 18 inches off the ground. The increase in engine size of 24 inches would have meant that the new LEAP engines on the 737 Max would have been on the ground. http://www.dept.aoe.vt.edu/~mason/Mason_f/B737.pdf

Note 2: some reports have indicated that the LEAP 1B Engine height is only 12 inches greater than the previous engine. However, the following source indicates that while the fan is 11 inches higher, **the LEAP 1B engine is 17 inches higher.** https://en.wikipedia.org/wiki/CFM_International_LEAP

How far forward and how far up did Boeing place the new LEAP engines?

Sadly, Boeing has not publicly stated how far forward and how far up they placed the new LEAP 1 B engines. Apparently, no reporter has ever bothered to ask or do the needed research. We are therefore forced to guess this crucial information. Here are some diagrams indicating the location and ground clearance of the LEAP engine on the Airbus A 320 NEO and 737 Max compared to previous engines on previous planes.

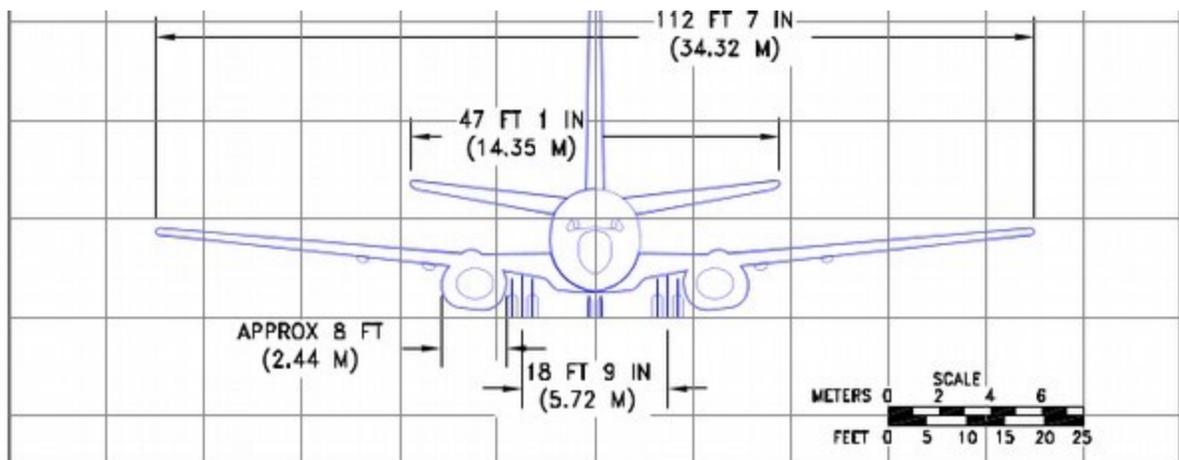
737 Max:

<http://www.boeing.com/assets/pdf/commercial/airports/acaps/737MAXbrochure.pdf>

737 NG:

<http://www.boeing.com/assets/pdf/commercial/airports/acaps/737.pdf>

The Boeing 737 wing is about one foot thick at the engine



2.2.11 GENERAL DIMENSIONS

MODEL 737-800

D6-58325-6

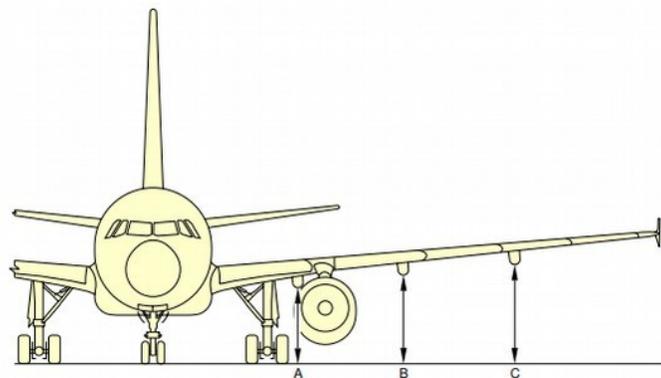
38 JULY 2007

Here is a diagram of the Airbus A320 NEO:

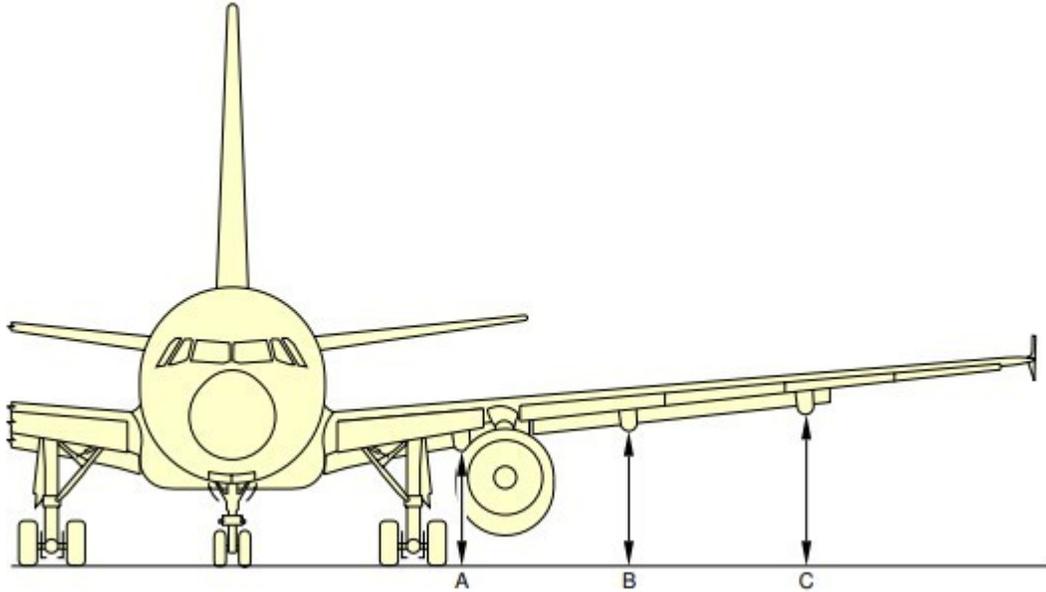


According to the following document, the A320-200 has 24 inches of clearance from the bottom of the engines to the ground and the A320-NEO has 18 inches of clearance. https://www.airbus.com/content/dam/corporate-topics/publications/backgrounders/techdata/aircraft_characteristics/Airbus-Commercial-Aircraft-AC-A320.pdf

Adding in the diameters of the engines, it appears that the top of the A320 engine is 24 inches plus 83 inches = 107 inches. It was also located about 18 inches below the top of the wing. Here is a front view of the A320. Note the space below the wing at Point A. :



The top of the A320 NEO engine is 18 inches plus 89 inches = 107 inches. It is located 7 inches below the top of the wing. Here is a front view of the A320 NEO. The NEO has no space below the wing at Point A. But the engine is still several inches under the top of the wing:



Equally important, the wing on the Airbus A320 and A320 NEO is slightly further towards the back of the plane – meaning that an MCAS system is not needed to prevent the nose of the A320 NEO from rising.

Either Airbus got extremely lucky or they were able to predict in 1980 that engines would eventually get bigger over time. Either way, in the 1980's, Airbus designed the A320 with several inches of extra room under the wing and they were able to easily change from the A320 to the A320 NEO without significant modifications.

Because the A320 was already much further off the ground, there was no need to change the overall design of the A320 to accommodate the bigger engine. Its first test flight was in September 2014 and first commercial flight was January 25 2016 – a full year ahead of the Boeing 737 Max. As of April, 2019, Airbus has received 6,500 orders for the Neo and delivered 778 planes. The Airbus Neo does cost about 10% more than the Boeing 737 Max (\$110 million versus \$100 million). But they are also more fuel efficient as they have bigger engines.

The difference between the LEAP engine and the previous engine was about 24 inches. There was simply no way that the original 737 design could be made to fit this new LEAP engine. Remember that Boeing had to alter the engine to a hamster shape and move the engine as far up and as far forward as possible just with their 737 NG just to accommodate the 11 inch increase from the original 737 to the 737 Classic.

So Boeing decided to move the engine even more forward and more up. The problem with moving the engine forward is that the engine itself acts as an extension of the wing – increasing lift more towards the front of the plane. While only moving forward a few inches, this is all it takes to force the teeter totter to tip too far towards the front of the plane. This destabilizing effect is minimal at a normal flying low angle of attack (less than 5 degrees). But it will increase dramatically when the airplane is climbing with an AOA above 15 degrees.

Here are some images of how far forward and how far up the new LEAP 1B engine is on the 737 Max. First is a closeup view showing how big the new LEAP engine is and how far forward it has been placed in front of the wing:



Another closeup view:



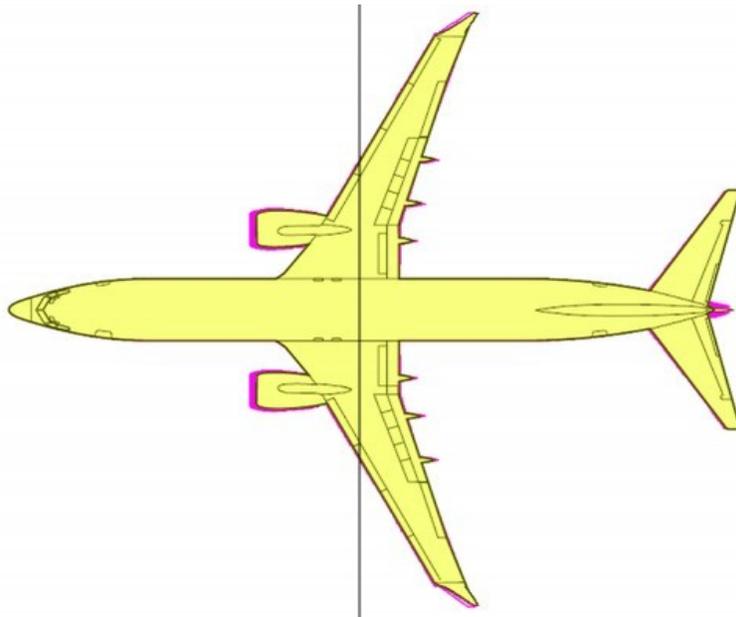
Here is a more distant side view:



Here is a view of the underside of the 737 Max while in flight:



Here is a picture of the 737 Max Engine forward placement in relationship to the Center of Gravity:



Based on the above images, and the above calculations, I estimate that Boeing moved the 737 Max LEAP engines about one foot forward and one foot up compared to the placement of the previous 737 NG engines. I further estimate that the thickness of the wing where the engines are attached is about one foot.

Why moving the engine above the wing creates a lot of instability

It is likely that moving the engine above the wing is an even bigger danger than moving the engine more in front of the wing. This is because the irregular shape of the engine placed above the wing is certain to create more turbulence. Here is a closeup picture showing the placement of the 737 Max engine above the wing in comparison to the previous placement of the 737 NG engine:



The above picture makes it appear as if the 737 Max engine is slightly below the wing. But remember that at takeoff and while climbing, the 737 Max is at a nose up angle. The more the nose is up, the higher the engine is in relationship to the wing and the greater the turbulence is created by the engine in relationship to the wing. Here is a picture of the 737 Max shortly after takeoff showing this problem. Note that **from the moment the 737 Max leaves the ground, both engines are already several inches above the wings.**



The turbulence created by placing the engines above the wings increases with speed and increases with the Angle of Attack. The 737 Max is the first commercial airplane to place the engine above the wing. It will likely be the last.

It is the fact that the 737 Max has the engine placed too far in front of and above the wing that leads to the conclusion that the 737 Max is the most unstable commercial airplane ever built. There is no solution for this problem other than to stop making the 737 Max and replace it with an entirely new airplane designed to be far enough off the ground so that the engines can be put in a more stable position. Oh, that would be the Airbus A320 Neo.

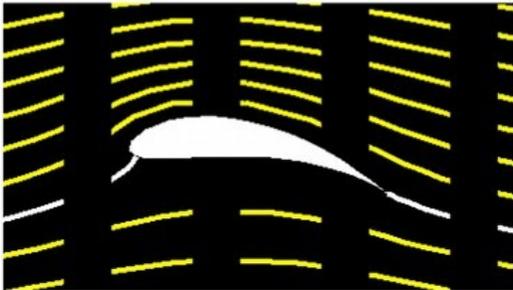
Equation for Lift of an airplane wing

The lift equation states that lift L is equal to the lift coefficient Cl times the density r times half of the velocity V squared times the wing area A.



The Lift Equation

Glenn
Research
Center



$$L = C_l \times \frac{\rho \times V^2 \times A}{2}$$

Lift = coefficient x density x velocity squared x wing area
two

Coefficient **Cl** contains all the complex dependencies
and is usually determined experimentally.

Lift depends on the density of the air, the square of the velocity, the air's viscosity and compressibility, the surface area over which the air flows, the shape of the wing, and the wing's inclination or angle to the flow. In general, the dependence on wing shape, inclination, air viscosity, and compressibility is very complex. One way to deal with complex dependencies is to characterize the dependence by a single variable. For lift, this variable is called the lift coefficient, designated "Cl." This allows us to collect all the effects, simple and complex, into a single equation... For given air conditions, shape, and inclination of the object, we have to determine a value for Cl to determine the lift.

For some simple flow conditions, aerodynamics can determine the value of C_l mathematically. But, in general, this parameter is determined experimentally.

<https://www.grc.nasa.gov/www/k-12/airplane/lifteq.html>

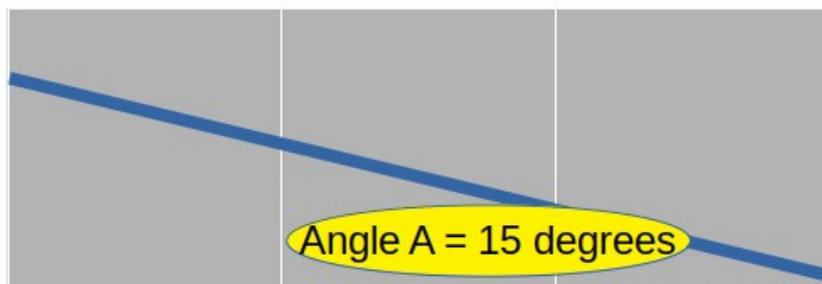
Note that the lift is proportional to the area of the wing. Because the engine becomes part of the wing, moving the engine forward a few inches increases the area of the wing by a few inches. This is therefore a minor increase in the lift of the wing and can be offset by an MCAS change of 0.6 degrees in the tail flap. The above equation assumes that there is no turbulence and does not account for the angle of attack of the plane or wing.

Why there is no accurate equation for Turbulence

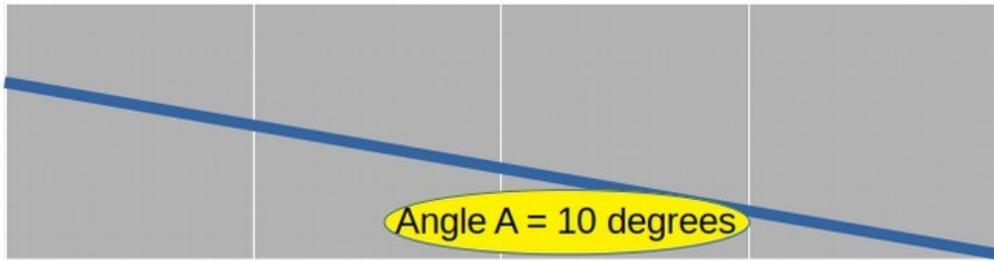
Turbulent flow is air motion characterized by chaotic changes in pressure and flow velocity. It is in contrast to laminar flow, which occurs when air flows in parallel layers... The fact that Boeing engines mis-calculated by a factor of 4 the amount of MCAS needed to offset the nose lift of the 737 Max is evidence that they were confronted with a very difficult math problem. Here we will briefly summarize some of the problems created by turbulence of placing the engine at the same level as the wing when the plane was level.

<https://royalsocietypublishing.org/doi/full/10.1098/rsta.2010.0332>

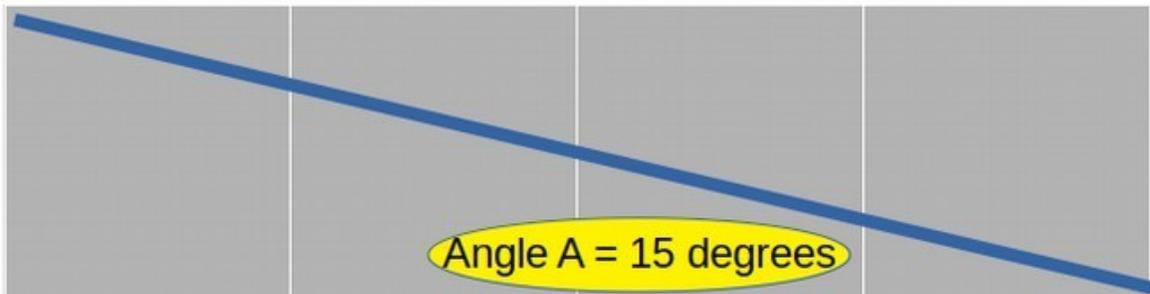
For the 737 NG, at an angle of attack of 15 degrees, assuming the engine was placed 3 feet in front of the wing, and the engine was placed 12 or more inches below the wing, the height of the engine exposed to turbulence would be minimal:



For the 737 Max, at an **angle of attack of 10 degrees**, assuming the engine was placed 4 feet in front of the wing, and was raised 12 inches to be even with the top level of the wing, the height of the engine exposed to turbulence is about 8 inches (4 times 0.176 feet = 0.7 feet = 8.4 inches):



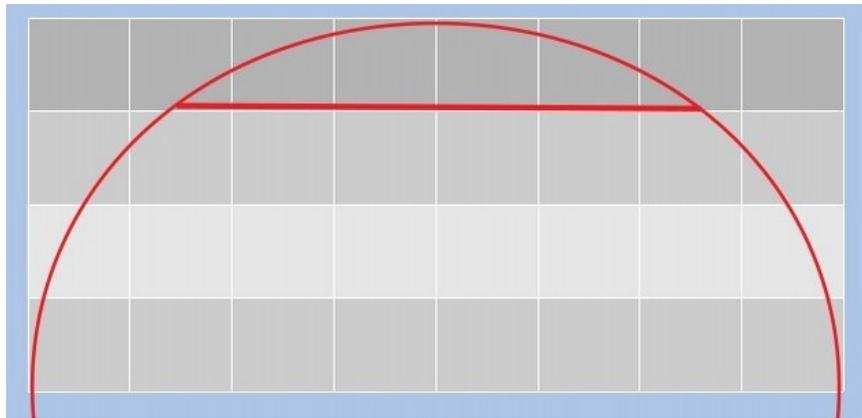
For the 737 Max, at an **angle of attack of 15 degrees**, assuming the engine was placed 4 feet in front of the wing, and was raised 12 inches to be even with the top level of the wing, the height of the engine exposed to turbulence is about one foot (4 times 0.268 feet = 1.1 feet = 13 inches):



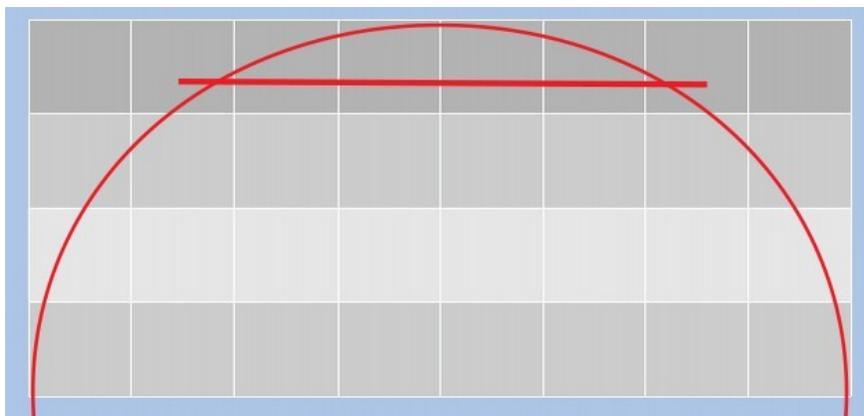
If the tangent of a right triangle is four (the ratio is one over four or 0.25) , then the smaller angle is 14.5 degrees. See this table.
<https://www.grc.nasa.gov/WWW/BGH/tabltan.html>

Diagrams for 787 Max Engine Exposure over Wing related to area of diameter of circle

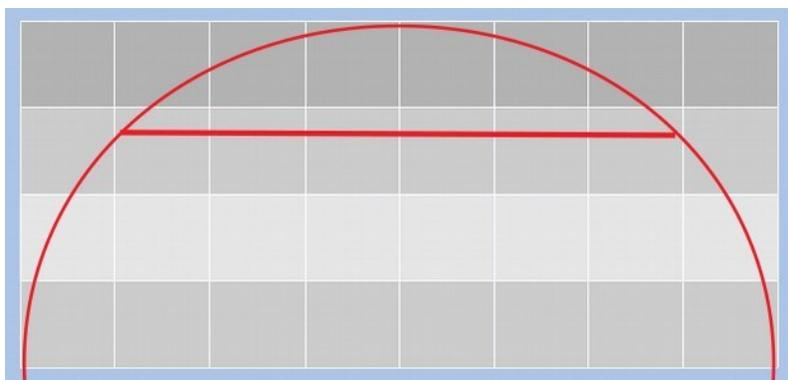
The 737 Max engine has a diameter of about 88 inches. Here is a diagram of a cord of a half circle with a radius of 44 inches and a cord height of 11 inches. (Each box is an 11 inch square).



Here is a cord height of 8 inches (10 degree AOA):



Here is a cord height of 13 inches (15 degree AOA):



Note that there is a rapid increase in the area of the engine exposed to turbulence for every inch of engine raised above the wing (dark shaded area). This is why the engine should never have been raised above the wing. This was a huge error.

Here is a link to a paper which attempts to discuss turbulence in wind tunnel tests of small flying objects (drones). The forces are obviously much greater on a 737 Max but some of the principles discussed can apply.

http://www.icas.org/ICAS_ARCHIVE/ICAS2012/PAPERS/970.PDF

Here is an image from this study. Note that the turbulence increases from the front of the wing (on the right) to the tail of the wing (on the left). This is due to the rolling nature of dynamic turbulence. Think of it as a series of rolling waves.



Figure 9: Leading edge separation and enhanced shear layer roll up, leading to the formation of a vortex. AoA = 10Deg, Ti=12.3. [18]

Here is another image showing the pressure increasing from the front of the wing (right) to the tail of the wing (left):

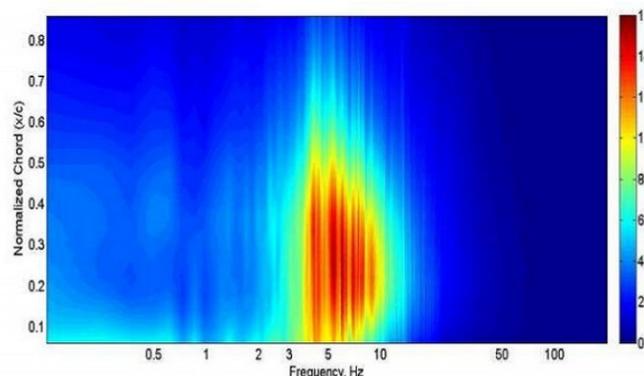
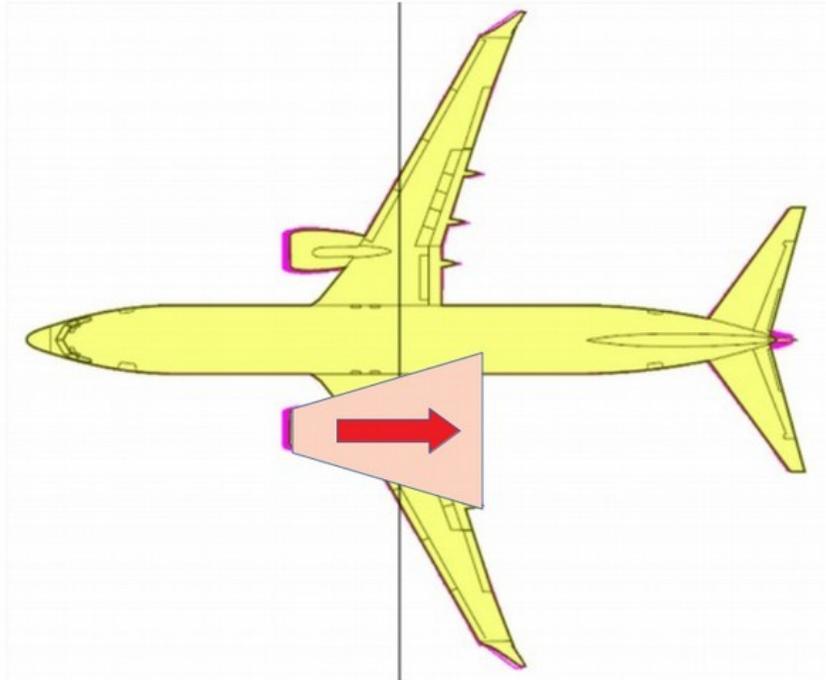


Figure 11: Consolidated spectra of pressure fluctuations occurring over airfoil at AoA 10°. Ti=7.2%, Lxx/c=1.

Now think of the wing of the 737 Max as a teeter totter pivoting around the center of gravity. The increase in turbulence (reduction in lift) will be greater on the back of the wing than it will be on the front of the wing.



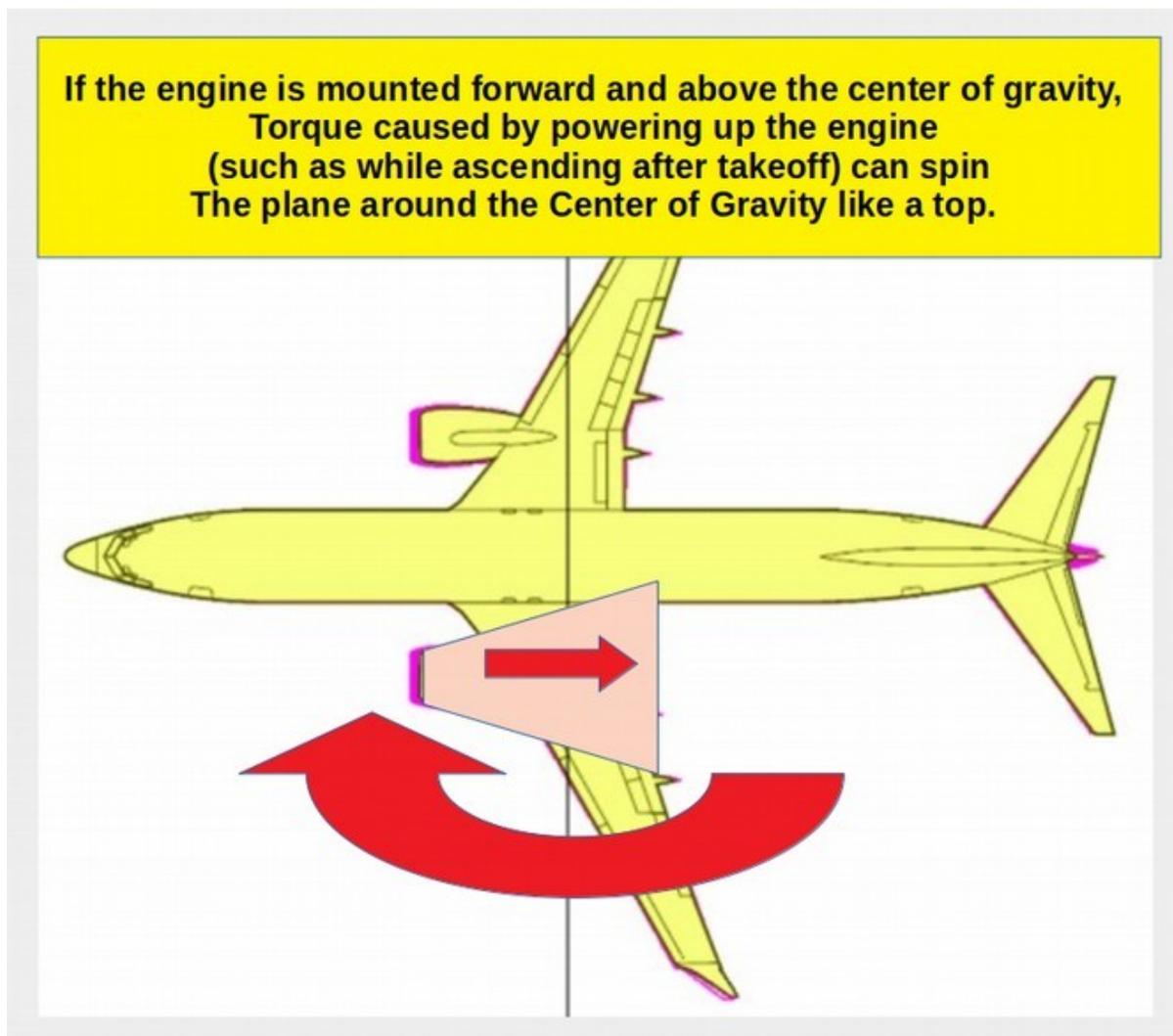
The will greatly increase the ratio of the lift at the front of the plane. I believe that it is this extremely complex effect of turbulence that was missed in the initial calculations and was only discovered in 2016 during test flights of the actual Boeing 737 Max. The problem was not so much moving the engine forward. It was moving the engine up. This dynamic increasing effect of turbulence forced engineers to raise MCAS from 0.6 degrees with no repeat to 2.5 degrees – with a repeat function.

Boeing has now proposed to reduce MCAS to some lower un-announced value. But all this new change in MCAS will do is increase the risk of a crash resulting from a stall. The real problem is that the two new engines should never have been raised several inches. Boeing over-confidence caused them to build the world's most unstable commercial airplane.

The Trouble with Torque

There is a third problem with moving the 737 Max engine up and forward. In addition to increasing lift in front of the center of gravity – pushing the nose up – and reducing lift with turbulence behind the center of gravity, the position of the new engines will also produce torque when the engines are revved up. This will also push up the nose of the plane and cause the 737 to spin like a top.

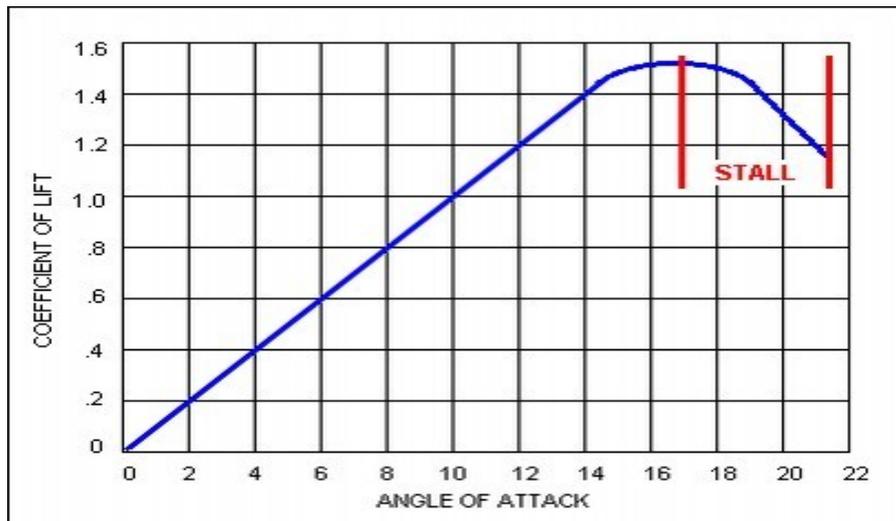
Here is what torque looks like:



When the engines are too far away from the center of gravity, they create a torque, pushing the aircraft nose up when the engines are set at full power. This is dangerous because the angle of attack is already likely to be high during and after takeoff. Gunning the engine would cause the aircraft to raise the nose even higher resulting in a catastrophic and unrecoverable stall leading to a crash. This torque problem could be another reason MCAS was set for 2.5 degrees instead of 0.6 degrees.

6 Calculating the Odds of the Next 737 MAX Crash

We saw in the previous section that the ideal angle of attack is about 17 degrees. However, beyond 20 degrees, an airplane actually loses lift rapidly due to the sudden appearance of turbulence. This is a very narrow range of angles between ideal lift (17 degrees) and quick death (about 25 degrees).



Pilots approach this angle of 17 degrees shortly after takeoff in order to gain altitude as quickly as possible. MCAS does not kick in until about one minute after takeoff. Even then, **MCAS does not kick in until the AOA sensor(s) indicate that the angle of attack is above about 20 degrees.** Using the current MCAS (before the new software fix), MCAS will automatically push up the tail about 2.5 degrees over a 10 second period. Due to the 8 to 1 lever arm effect, this will lower the nose about 20 degrees over 10 seconds. In short, the current version of MCAS is intended to bring the plane from a dangerous angle of 20 degrees back to a nearly level angle.

Calculating the Odds of a Crash with the current version of MCAS

Let's assume that there were an average of 333 Boeing 737 max airplanes in service during the past year and that each one of them takes off and lands 3 times a day. That is about 1000 737 Max missions per day. Lets also assume that all of these planes were in service for about 500 days before they were grounded. This would mean that two disasters occurred in 500,000 missions. This would put the odds of a crash at 1 in 250,000.

Put this way, it looks like the 737 Max - even with the current MCAS settings - has been a pretty safe plane. But that is not how the public looks at plane crashes. The public wants the odds of them dying in a plane crash to be much less than one in a million. The safety record of the current 737 Max is therefore not acceptable to the flying public.

Calculating the Odds of a Crash with the new version of MCAS

Let's assume that the FAA rubber stamps Boeing's new "fixed" version of MCAS and that 737 Max planes start flying again on **September 1, 2019**. Let's further assume that airline carriers are crazy enough to accept delivery on the 300 or so 737 Max planes that will be parked in airports all across Washington state and these new airplanes join the fleet of 387 current 737 Max planes. This would mean that nearly **700** 737 Max planes will be making 3 trips a day by September 2019. If there was no change in risk between the new MCAS and the old MCAS, simply this 80% increase in the number of 737 Max planes would increase the risk of one of them crashing on any given day by 80%.

But let's make two more assumptions. First, let's assume that half of the problem was the reliance on a single sensor and that changing to two sensors fixes this half of the problem. One might assume that this would bring the risk factor back down to about one in 250,000 missions.

But we need to also make one more assumption. This is that **the Boeing test engineers in 2016 knew something very important that we currently do not yet know – and these test engineers in 2016 - who changed MCAS from 0.6 degrees of change and no repeat to 2.5 degrees of change with a repeat function – were not idiots.** They clearly believed in the summer of 2016 after getting the test results from the initial four 737 Max planes that the safest settings for MCAS was 2.5 degrees with a repeat function. They had concluded based on several test flights that the 737 Max had such a huge risk of the nose going up and causing a stall that it had to be prevented at all costs. That is the only reasonable explanation for why they made this change in the first place. Therefore, any new setting for MCAS (such as the current fix) that is less than 2.5 degrees and lacks a repeat function must be **LESS SAFE** than the current setting of MCAS! In short, while Boeing is making some changes that might reduce the hazard, they are making several other changes that are likely to increase the hazard of a crash.

These other changes that increase the hazard of a 737 Max crash include putting more a lot more 737 Max planes in the air and reducing the power of MCAS to prevent a stall. As Boeing will continue to deliver 50 737 Max planes per month after September 2019, there will be at least 1400 Boeing 737 Max Death Traps in the air every day by October 2020.

Table of 737 Max Planes Made Parked and Delivered

Year/Month	Monthly Rate	Parked	Delivered	New Total
2019-Jan	52	0	52	382
2019-Feb	52	47	5	387
2019-March	42	89	0	387
2019-April	42	131	0	387
2019-May	42	173	0	387
2019-June	42	215	0	387
2019-July	42	257	0	387
2019-Aug	42	299	0	387
2019-Sept	52	52	299	686
2019-Oct	52	0	104	790
2019-Nov	52	0	52	842
2019-Dec	52	0	52	894
2020-Jan	52	0	52	946
2020-Feb	52	0	52	998
2020-March	52	0	52	1050
2020-April	52	0	52	1102
2020-May	52	0	52	1154
2020-June	52	0	52	1206
2020-July	52	0	52	1258
2020-Aug	52	0	52	1310
2020-Sept	52	0	52	1362
2020-Oct	52	0	52	1414

The odds of one of these 1400 to 1500 737 Maxes crashing before the end of 2020 are extremely high – much greater than 50%. And the odds will only increase every month and every year after that as the number of dangerous Mad Maxes in the sky will only grow until one of them crashes. Keep in mind that the eventual plan is to put 5000 of them into the sky.

The only difference between the next crash and the two previous crashes will be that the next crash will be from the result of a stall caused by the nose up problem that MCAS was not able to stop - rather than a crash from the result of a a dive caused by an over-active MCAS. In previous versions of the 737, when you pull five pounds of force on the yoke, you get five degrees of pitch change, and when you pull 10 pounds, you get 10 degrees of pitch change. However, on the MAX, it only takes a 10-pound pull to get 15 degrees of pitch. This was why MCAS was needed. But instead of too much MCAS, the new 737 Max will have too little MCAS. This is the problem with a plane that is inherently unstable.

Here is an extremely important question that no one in the corporate media has ever asked: Why was the repeat function added to MCAS?

The current repeat function, which will not be present on the new “fixed” version of the 737 Max, was clearly intended to serve some purpose. It was not added by accident. The purpose is likely due to a “positive feedback loop” that only becomes apparent in the 737 Max when it is very close to a stall AOA of 20 to 25 degrees (the test required to pass FAA certification in 2016).

This positive feedback loop likely increases the nose angle very rapidly. We can assume this is true because first, the initial change of the current MCAS is also very rapid – a rate of 2 degrees per second for 10 seconds. We can also assume this is true because MCAS only waits 5 seconds before repeating the nose down action for 10 more seconds. Such a rapid change of 40 degrees over 25 seconds means that the 737 Max must have a tendency to go into a nose up stall position of 40 degrees in 25 seconds.

Removing the repeat function, on the surface, may seem to make the 737 Max safer. But it does nothing to change the aerodynamics of the 737 Max.

Therefore, eliminating the repeat function may actually make the 737 Max less safe by increasing the odds of it going into a 40 degree nose up stall position.

Here is a good analogy published by the Observer on May 17 2017:

To give an example of what occurred, imagine a car company builds a new model that, due to the design, the front of the car points upward when driven faster than 30 miles per hour. To “fix” the problem, the car company increases the weight in the front of the car by 500 pounds. Technically, the car rides more level. However, due to an imbalance in weight between the front and rear of the car, the car can skid sideways when going around corners. No need to worry. The engineers at the auto company create software that forces the car to drive slower around corners eliminating the issue. Over a period of weeks and months, reports begin to surface that when the car is forced to drive slowly around corners, it’s nearly impossible to steer the car and keep it on the road. “That’s an easy fix,” proclaim the engineers, and software is developed to automatically steer the car around corners. For a while, all is well. Unfortunately, in a period of several days, multiple families are killed while driving the car, because for some unknown reason, the car decides to start steering itself without warning and multiple crashes occur. “Not to worry,” states the CEO, “we’ll quickly make improvements and when we are finished, the car will be the safest on the road.” And the victims? They’re buried and gone forever.

What should happen to the 737 Max? Nothing. The plane should permanently be grounded. No husband should ever allow his wife or family to fly on a 737 Max. No wife should allow her husband to fly on a 737 Max. No parents should ever allow their children to fly on a 737 Max. No one who cares about anyone should ever allow them to fly on a 737 Max. The families of the passengers killed in the [two 737 Max crashes](#) are in a nightmare that will never end. The desire of Boeing to get the 737 Max flying again doesn’t justify the risk of more crashes on a plane that should never have been certified to fly in the first place. <https://observer.com/2019/05/boeing-737-max-software-fix-permanently-ground/>

Factors that will increase the likelihood of the next crash

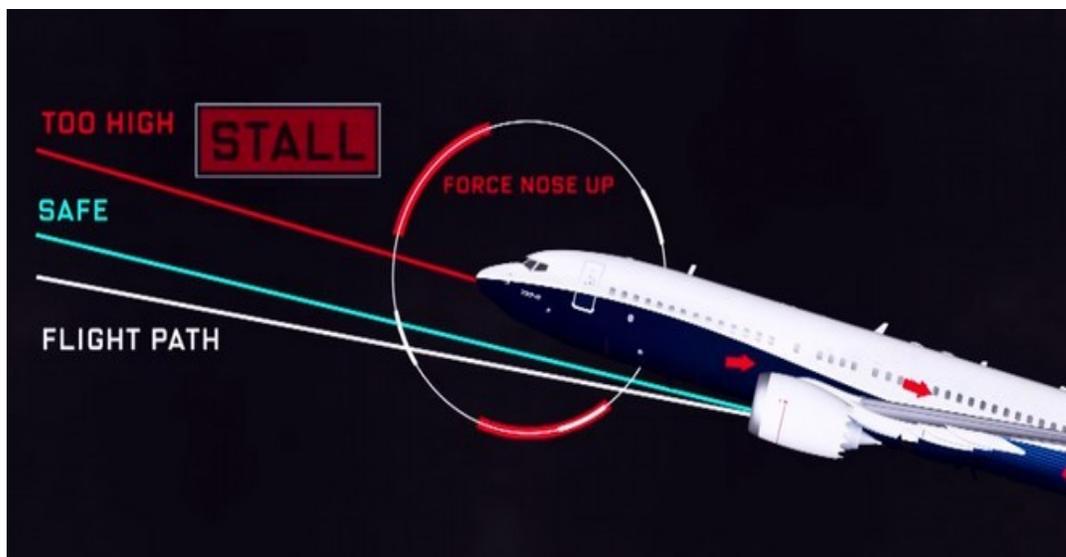
First, it is likely that the next crash will involve a less experienced pilot flying for a discount airline. A highly experienced pilot is not likely to ever crash a 737 Max because a highly experienced pilot will be very careful not to let a 737 Max get into a 20 degree AOA nose up position in the first place. An experienced pilot would never trigger MCAS and does not need MCAS and would likely turn it off the first time it was active.

Second, there likely will be some sort of front wind, cross wind or tail wind combined with vertical turbulence such as a thunder cloud associated with a Cold Front. There will likely be icing on the wings and icing on both AOA indicators. A flock of birds could also cause a problem for the AOA sensors.

Third, there will be limited visibility preventing the pilot from seeing that their Angle of Attack is too high. Clouds will likely be very thick all the way down to the airport.

Fourth, there will be some reason the plane needs more lift. One example is a plane that is over loaded with baggage and passengers. Another reason is that there is some mountain range in front of the airport the plane needs to climb over. Any several reasons could cause a pilot to want to gun the engine to the maximum. When this happens, torque will cause the nose to rise up very rapidly.

All four of the above factors will increase the odds that an inexperienced pilot will exceed the 20 degree maximum nose up position. When he or she does, a reduced power MCAS will not be enough to return the nose to a level position. This is especially true if the pilot has turned MCAS off due to erroneous sensor readings. The complete stall will occur in less than 25 seconds and the pilot and passengers will suffer the same fate as the two previous crashes – even though the actual cause will be from an extreme nose up event instead of an extreme nose down event.



There are some lessons here. First, either do not fly on a 737 Max or, if you do, do not fly with an inexperienced pilot on a discount carrier when the weather is bad and the wind is blowing. Also try to avoid migrating geese. Hopefully, you can now see why I am so certain that a 737 Max accident will occur somewhere in the world by the end of 2020.

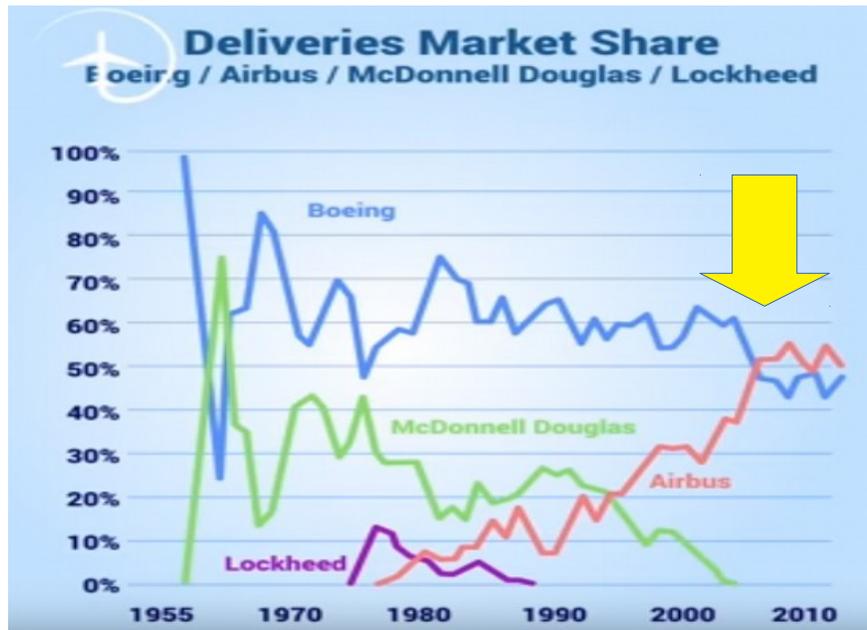
But since there are more 737 Maxes in the US than in the rest of the world (see graph below), the odds of a crash are more likely in the US or Africa than in other parts of the world since a higher percentage of 737 Max planes are being sold in the US and Africa.



Now that we better understand how serious this problem is, let's take a quick trip down memory lane to see how Boeing executives were lured into making such a terrible decision in the first place.

7 Corruption as a Business Model

If there is one chart that describes not only the history of the 737 but also the history of Boeing, it would be this chart of the market share of annual commercial airplane deliveries of Boeing from 1955 to today. :



Until Airbus started in the 1980s, Boeing enjoyed a virtual monopoly. However, due to a series of blunders by Boeing upper management, even before the competition from Airbus, Boeing employees and the economy of Washington state was subjected to a very rocky ride.

Boeing commercial airplanes began with the success of the 707 which was built from 1957 to 1979. The plane had four jet engines under the wings. This was followed by the 727, which was built from 1964 to 1984 and had three engines all at the tail of the plane. In 1957, employment at Boeing topped 100,000 for the first time, with most employees working at either the Seattle or Renton factories.

In the 1960s, Boeing decided that Jumbo Jets were the future. Boeing bought Paine Field in south Everett to build the 747. The workforce at Everett soon exceeded 20,000. In 1968, employment at Boeing reached 142,000 with as many as 100,000 additional people working for local Boeing sub-contractors.

1969 to 1979 The Boeing Bust

The first 747 rolled out of the world's largest building near Paine Field in 1969. Unfortunately, in the 1960's, Boeing executives bet the farm that Super Sonic Transports were also the wave of the future. They spent a fortune developing an SST called the Boeing 2707. Unfortunately, the SST caused a sonic boom on takeoff. The SST was feared to damage the Ozone Layer which protects the earth. Congress therefore suddenly stopped funding the 2707 in May 1971 and the SST was banned in the US. At the same time, there was a downturn in the commercial aviation market. Boeing laid off more than 25,000 workers in 1969 and another 41,000 in 1970. Then in 1971 came devastating news. When Congress cut funding for the SST, Boeing cut 20,000 more jobs. The workforce hit a low of 56,300. This Boeing Bust had put 86,000 workers on the street in three years. In April 1971, someone placed a huge billboard near Interstate 5, with the grim request, "Will the last person leaving Seattle turn out the lights."



1980 to 1990 Airbus offers a better plane with bigger engines

By 1980, Boeing's employment rebounding back to more than 100,000 thanks in part to orders for the 737 Classic . Then Airbus came out with the A320 twin engine single isle airplane to directly compete with the 737 Classic. The advantage of Airbus was that they had the wisdom to understand that new more fuel efficient engines would be bigger than the older gas guzzlers used by Boeing. Airbus therefore created a better design with more room under the wing for these new more fuel efficient engines. Since 1987, Airbus has sold 8,000 A320s.

As a direct result of competition from Airbus, and their bigger more fuel efficient engines, in 1992 Boeing announced another layoff of 28,000 workers. As the trend toward bigger more fuel efficient engines was obvious as far back as 1970, Boeing must have realized the design flaw of the 737 and the lack of engine space back in 1980. After all, they had been forced to alter the 737 Classic engines into an extreme hamster shape in the 737-300 which was announced in 1981 and certified in 1984 . But the problem was that management was not willing to reduce short term profits in order to do a complete redesign of the 737. They therefore kicked the can down the road in the the 1980s and they continued to kick the Wing problem can down the road in the 1990s. This is why they were losing market share to Airbus.

1990 to 2000 A Culture of Corruption

In the 1990's, it became obvious that the bigger and more efficient Airbus engines would drive Boeing out of business. Boeing then began to design a more fuel efficient version of the 737 called the 737- Next Generation or 737 – NG for short. The first 737-700-NG was flown on July 31, 1997 and certified by the FAA in 1998. However, once again, Boeing failed to recognize that the trend to bigger engines would continue. Instead, Boeing once again kicked the engine can down the road in order to keep their profit margins as high as possible. The engines for the 737 NG were still shaped like hamster cheeks and were only one inch bigger than the prior 737 Classic engines. Boeing had obviously come to the end of the line in terms of how big of an engine they could fit under the wing of the 737 without a complete redesign.

In 1997, Boeing merged with one of its chief competitors in the defense field, McDonnell Douglas. Many articles and even books have been written about how the Culture of Corruption at McDonnell Douglas was transferred to Boeing as a result of this merger. However, I think the failure of Boeing to redesign the 737 in the 1980s or 1990s to make more room under the wing for larger engines is evidence that Boeing already had its own Culture of Corruption.

Boeing Workers Pay a Heavy Price

As just one example of the Boeing Culture of Corruption, Boeing has refused to accept responsibility for illnesses caused by the chemicals in its plants. Boeing employed scientists to question or deny physical maladies and to even deny the existence of diseases like Multiple Chemical Sensitivity, which causes a

breakdown of the immune system from continual inhalation or contact with certain chemicals Boeing uses. Boeing also used its influence in the Washington Department of Labor and Industries (L&I) to deny the existence of any such ailment. One estimate of Boeing's potential liability in these claims was \$450 million. Details of Boeing's record of refusal to acknowledge injuries to its workers is documented in: Eric Nelson and Mark Worth , "Boeing to ill workers: 'It's all in your head'": Washington Free Press, Feb/March 1994
www.washingtonfreepress.org.

Boeing Launches Corporate Crime Wave

Instead of sticking to "legal" forms of robbing money from the public purse, such as military contracts, Boeing has employed Enron-like accounting and has broken the law many times in its insatiable drive for increased profits at all cost.

In 1994, Boeing paid \$75 million to the federal government to avoid criminal prosecution of overcharges on the KC-125 tanker. Business Week did a three-month investigation of Boeing's questionable accounting practices during the lead-up to its 1997 merger and takeover of rival McDonnell Douglas. Business Week found that Boeing artificially inflated its earnings for two quarters in 1997 by \$2.6 billion dollars, thus hiding the fact that production costs were running much higher than was disclosed to investors. Business Week wrote: "Boeing did more than simply fail to tell investors about its production disaster. It also engaged in a wider variety of aggressive accounting techniques that papered over the mess."

In a deal approved by a US. District Judge, Boeing settled a private securities-fraud suit over the 1997 episode for \$92.5 million, rather than let it go to court. (See Stanley Holmes and Mike France, "Boeing's Secret- Did the aircraft giant exploit accounting rules to conceal a huge factory snafu": Business Week, 5/20/02).

Since 1995, Boeing has agreed to pay \$1.5 billion to settle 70 instances of misconduct, including \$615 million in 2006 in relation to illegal hiring of government officials and improper use of proprietary information.

<https://www.contractormisconduct.org/>

<https://www.contractormisconduct.org/misconduct/300>

In 1997, Boeing and other major corporations and billionaires succeeded in getting one of the largest tax breaks in Washington state history passed by the Washington state legislature – the commercial intangible property tax exemption. This tax exemption has cost Washington state more than one billion dollars per year – causing Washington state to drop from 11th in the nation in school funding down to 47th in the nation – and forcing Washington states one million school children to endure the highest class sizes in the nation. In November 2000, the Voters of Washington state responded by passing Initiative 728 – the Class Size Initiative – by a margin of nearly 2 to 1. But thanks to Boeing tax breaks, it has never been funded.

2000 to 2010 From Tax Dodging to Blackmail

In May 2001, even though the airplanes were still being made in Seattle, Everett and Renton, Boeing executives moved their corporate headquarters from Seattle to Chicago. Little has been written about why this move occurred. But likely reasons included tax evasion. Boeing already had been evading paying the Washington state sales tax by literally flying new planes out of Washington state and signing sales contracts over the Pacific ocean. Boeing also had been using similar methods to avoid paying the Washington State one percent Business and Occupation tax.

Boeing evaded Washington state 5% sales tax and 1% Business tax by claiming that the sale was made "overseas,"- i.e. not in Washington. A Boeing flight crew flew a new plane from Seattle to just past the 200-mile limit of US. sovereignty off the Washington coast, at which time money is transferred by wire and a new crew flew the plane back to Seattle, completing the sale. Had Boeing been required to pay the sales tax on the sale of its airplanes – like any other business in Washington State – it would have paid at least 5% to 6% of an estimated \$40 billion in annual sales. **This is more than \$2 billion per year in Boeing state tax evasion. This illegal tax dodge is still going on.**

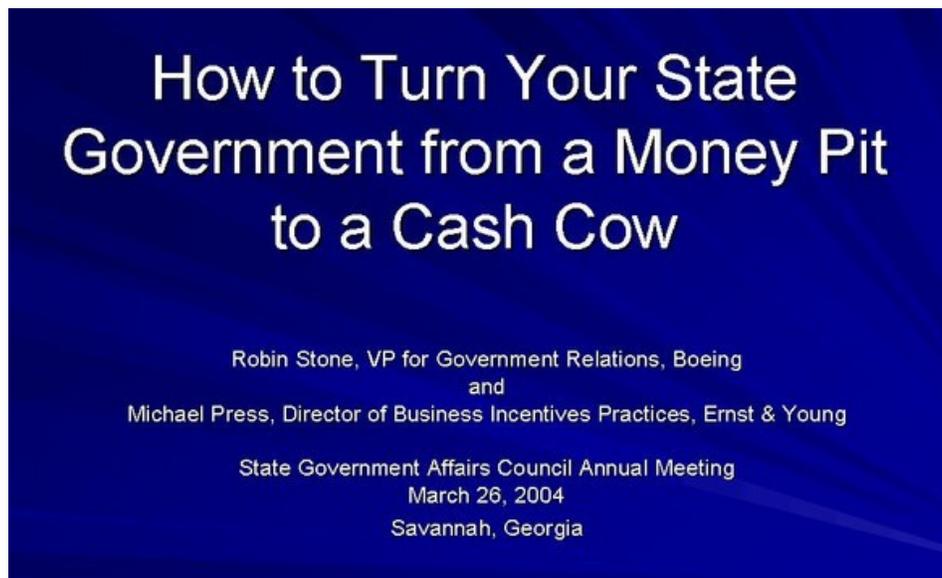
(Source: Exemptions to Washington state business taxes: "Tax Exemptions 2000, 2004 and 2008", published by Washington State Department of Revenue. Boeing's exemption to sales tax on the sale of airplanes documented in George Erb, "Biz fears state may roll back some tax breaks", Puget Sound Business Journal, 12/0/2001.

Boeing's tax-evasion trick of selling planes 200 miles offshore is documented in: Robert Cringely, "Through a Loophole, Darkly": I, Cringely, archived column, PBS, 10/8/98, www.pbs.org/cringely/pulpit/pulpit19981008.html

A sharp downturn in air-passenger traffic occurred following the September 11, 2001, terrorist attacks, which resulted in fewer airplane orders. Boeing responded on Sept. 19 2001 with a massive layoff. Boeing laid off nearly 30,000 people and its Washington workforce dropped to around 54,000.

2003 Boeing Replaces Tax Evasion with Outright Blackmail

In 2003, Boeing used the threat of outsourcing jobs to blackmail our legislature into giving them 3 billion in additional tax breaks. The legislature caved...and Boeing still outsourced thousands of the jobs anyway. Those tax breaks were supposedly to "save jobs." But that same year Boeing announced another thousand layoffs. So Washington state lost the money and the jobs. Nor was the tax break needed to make Boeing profitable as Boeing had been making over \$3 billion a year for the preceding several years. A Boeing Lobbyist called it turning our State legislature into a "Cash Cow."



Boeing union workers have referred to this outsourcing as the "Disappearing Boeing Airplane" because outsourcing of high paying jobs has been going on for many years. Many legislators privately refer to it as Corporate Welfare. In reality, it was nothing more than blackmail.

The \$3.2 billion in tax cuts for Boeing, provided with House Bill 2294 passed on June 11, 2003, was achieved by gutting funding for Washington states public schools that very same week (see House Bill 1449 which cut hundreds of millions of dollars per year in school funding in order to give Boeing hundreds of millions of dollars per year in tax breaks). The Washington state Governor and Legislature, many of whom had been given contributions by Boeing to win their election to office, repaid their corporate benefactors by giving Boeing an additional \$3.2 billion tax exemption deal. This was ten times greater than any other State had offered Boeing. Here is another slide from the Boeing lobbyist 2004 slide show:

Problem:
Public doesn't like corporate welfare!

- Solution: Threaten the public and the legislature with potential of job losses.

The 2003-2005 budget approved by the State Legislature cut \$600 million for the Biennium from K-12 public education and reduced public higher education by \$131 million. By gutting school funding, the legislature was cutting the jobs of about 2,000 teachers even as Boeing was cutting the jobs of more than 1000 workers.



According to an article published in the Seattle Weekly on December 24, 2003, called Billions for Boeing, the State also committed to \$4.2 billion in transportation improvements around the Boeing Renton and Everett plants.

Therefore, the total 2003 Boeing Tax Break package was \$7.5 billion on top of the \$2 billion per year they were already getting by evading the Washington state sales tax, Business and Occupation tax and evading the commercial property taxes. One union leader, interviewed after the 2003 tax breaks passed, referred to it as "the day corporate greed won."

Thanks to more than \$3 billion per year in state tax evasion, Boeing was doing extremely well. Boeing's combined commercial and military operations had sales of over \$50 billion per year. Average profits were about \$3 billion per year – due almost entirely to tax evasion. <http://boeing.mediaroom.com/index.php?item=1043&s=43>

For a more detailed list on the tax breaks given to Boeing, see also: http://www.wisconsinsfuture.org/publications_pdfs/otherpubs/BOEING%20REPORT4_web.pdf

In March 2004, Boeing lobbyists, fresh from their victory in Washington State, took their show on the road to a National Corporate Lobbyists Convention in Georgia. Here they put on a Power point Presentation explaining how other corporations could also evade paying State and federal taxes by blackmailing the public with the threat of job losses.

State Tax Incentives Take Many Forms

- **Hard Costs**
 - Income tax credits
 - Sales & Use tax exemptions/refunds
 - Real/Personal property tax abatements
 - Infrastructure grants/assistance
 - Free or discounted land/building
- **Human Resource Costs**
 - Wage rebates, job creation tax incentives
 - Employee training grants and credits
 - Federal & State targeted employment credits (WOIC, Welfare-to-work)
 - Hiring and employee screening assistance
- **Soft Costs**
 - Low cost financing for capital expenditures
 - Utility discounts
 - Waiver of permit fees
 - Expedited permits
 - Environmental/Pollution control incentives
 - Federal & State research and development credits

The Incentives were broken down into three categories: Hard Costs, Soft Costs (Hidden costs) and Human Resource Costs. It includes 27 different methods for getting tax breaks and Boeing has used all 27 methods listed above. Using this multiple forms of tax breaks strategy makes it almost impossible to determine the true cost to the public of all the Boeing corporate tax breaks. Boeing lobbyists actually boasted about how successful they were in manipulating the public and the legislature with threats of out sourcing jobs.

Why Boeing State Tax Breaks Are a Violation of the Washington State Constitution and are still owed to Washington State

Boeing forced the Washington legislature to give them tax breaks of over three billion dollars per year since 2003 – more than \$45 billion as of 2019. Nearly all of these tax breaks were paid for by robbing Washington state schools of funding – leading to students in Washington state to be forced to endure the highest class sizes in the nation since 2003. These Boeing tax breaks have always been a violation of the Washington state constitution. The state legislature violated the State Constitution in granting these tax breaks. Moreover the Washington State Supreme Court has ruled that State taxes owed have no Statute of Limitations – meaning that Boeing currently owes more than \$45 billion in back taxes to the tax payers and public school students here in Washington state.

Here are the relevant provisions in the Washington state constitution.

There are several major differences between the Washington State Constitution and most other state constitutions. Here are three of the most important differences as they apply to the State legislature diverting funds away from our public schools and into the pockets of Boeing.

#1 A clause making the ample funding of schools the paramount duty of the state (rather than making the adequate funding of schools one of the duties of the legislature). Unlike other states, which made it the duty of the legislature to adequately fund our schools, the drafters of our State Constitution created a shared Paramount Duty - a duty applied to the entire State Government including the Supreme Court - when they wrote **Article 9, Section 1: "It is the paramount duty of the state to make ample provision for the education of all children residing within its borders, without distinction or preference on account of race, color, caste, or sex."**

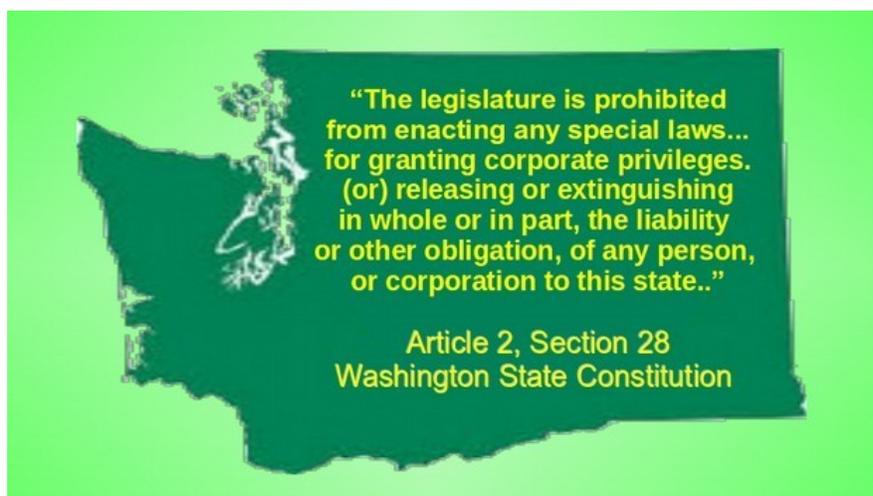
The Washington State Constitution is the only constitution in the nation to make it the Paramount Duty of the State to amply fund public schools. Thus, the drafters of our state constitution had one paramount goal, namely the ample funding of public schools. In order to achieve that paramount goal, they did everything they could think of to minimize the chances that powerful corporations like Boeing might corrupt and take over our state legislature.

#2 A clause requiring a uniform system of state taxes.

Article 7, Section 1 of our state constitution states: "The power of taxation shall never be suspended, surrendered or contracted away. All taxes shall be uniform upon the same class of property within the territorial limits of the authority levying the tax and shall be levied and collected for public purposes only. The word "property" as used herein shall mean and include everything, whether tangible or intangible, subject to ownership." Put another way, even if the legislature had fully complied with their Paramount Duty to amply fund our public schools, tax breaks to wealthy corporations would still be against the Washington State Constitution.

#3 Several clauses prohibiting the legislature from granting tax breaks to private corporations. Throughout the State Constitution, there are several clauses that indicate that granting tax breaks to private corporations is unconstitutional. Here are just a few of those clauses.

Article 2, SECTION 28 SPECIAL LEGISLATION. The legislature is prohibited from enacting any private or special laws...



Here are three of several clauses prohibiting tax breaks to corporations:

5. For assessment or collection of taxes, or for extending the time for collection thereof.

6. For granting corporate powers or privileges.

10. Releasing or extinguishing in whole or in part, the indebtedness, liability or other obligation, of any person, or corporation to this state.

Article 2, SECTION 30 BRIBERY OR CORRUPT SOLICITATION states:

"The offense of corrupt solicitation of members of the legislature, or of public officers of the state or any municipal division thereof, and any occupation or practice of solicitation of such members or officers to influence their official action, shall be defined by law, and shall be punished by fine and imprisonment."

Corporate lobbyists now control Olympia by offering bribes, called campaign contributions, to any legislator willing to pass laws to give their corporate masters special tax breaks. These bribes/ campaign contributions are all unconstitutional and the corporate lobbyists who are giving these bribes should all be put in jail.

Even after our Supreme Court ruled in 2012 that our public schools were not being amply funded (something obvious to any parent or teacher), the legislature continued to enact even more tax breaks - including a new \$9 billion tax break for Boeing that was the largest tax break in the history of the planet.

Billions in federal tax breaks for Boeing

Boeing received corporate welfare not only at the state level but at the federal level. Boeing's other source of public money is its deep engagement with the US. Department of Defense. Boeing's defense-related activities are totally dependent on our tax-dollars. Its research and development costs related to new technologies for improved military aircraft and spacecraft design are fully paid for by the US government. These innovations are a public gift to Boeing, which are then used in their commercial airline development.

As for federal tax breaks, in 2008, Boeing made \$3.8 billion in profit, but only paid federal taxes of \$44 million – an effective tax rate of less than 1%. In 2009, Boeing suffered huge losses due to bungled 787 outsourcing. But it still made a profit of \$1.6 billion on which it paid NO TAXES AT ALL.

Instead Boeing received a payment from the federal government of \$132 million. Thus combining the 2008 and 2009 tax years, Boeing made \$5.4 billion dollars in corporate profits on which they paid NO FEDERAL TAXES! In addition, **between 1992 to 2004, Boeing received more than \$12 billion in direct federal subsidies (about one billion dollars per year)** for research grants. Boeing is consistently number one or two on the list of Top US Federal Contracts receiving more than \$20 billion per year.

https://en.wikipedia.org/wiki/Top_100_Contractors_of_the_U.S._federal_government

2005 Boeing 787 Scandal... Even the Outsourcing was Outsourced

In 2004, despite the 2003 tax breaks, the Boeing workforce was once again at low ebb -- about a hundred thousand Boeing jobs had vanished in the Puget Sound area since 9/11, for total employment of 52,000 in Washington. The consequences of the decision by Boeing's upper management to bleed our State dry – and rob our children of their future - in the pursuit of short term greed should serve as a case study in why it is never good to give in to black mailers. It is proof that tax exemptions to wealthy corporations do not create jobs – they only cost jobs.

The Boeing 2003 tax deal was intended to protect the 787 Plant in Everett – which was claimed it would create 3,600 jobs. But in fact, there was no requirement that Boeing keep even a single job in Washington State in trade for getting billions in tax exemptions.

The December 2003 Seattle Weekly article noted that Boeing just two months earlier had laid off more than one thousand of workers – 800 from the Commercial Airplanes Division in October, 340 more in November and 165 more in December – for total layoffs during Fall, 2003 of 1,306 workers. All of these jobs were outsourced to other States and countries with cheaper non-union labor. The Seattle Times later reported that in fact only 200 jobs were created – a cost of more than \$10 million per job. “Huge Tax Break for Boeing did not deliver many new jobs,” Seattle Times Dec 17, 2007

Instead, Boeing used the billions in tax breaks they had gotten from the corrupt Washington state legislature to build a competing 787 plant in South Carolina. The South Carolina plant cost more than one billion dollars to build. It was paid

for almost entirely with tax breaks given to Boeing by Washington state. Delays and errors associated with Boeing's failed 787 outsourcing strategy have been estimated to cost more than \$20 billion.

Boeing Outsourcing cost \$20 billion

Despite paying almost no State or federal taxes, what has harmed Boeing's profit margins the most in recent years has been staggering losses resulting from their misguided outsourcing strategy. Problems with outsourcing have cost Boeing billions of dollars and led to a 2 year delay in production of their 787 Commercial airplane. On September 6, 2009, the New York Times reported on the financial impact of Boeing's outsourcing problems. See http://www.nytimes.com/2009/09/06/business/06boeing.html?pagewanted=1&_r=1

The article stated: "Boeing acknowledges that the problems have sorely tested the patience of suppliers and customers, and damaged its credibility. Already, 60 orders have been canceled, partly because of the delay. "

At an average sales price of \$125 million per airplane, the total value of these 60 cancellations have been \$7.5 BILLION in lost sales.

"Stock analysts estimate that the company initially planned to invest \$8 billion to \$10 billion in developing the project, but could end up spending \$20 billion, including the penalties it will owe for delivery delays."

Thus, penalties and delays resulting from outsourcing increased the development cost by \$10 BILLION.

"On Aug. 27, 2009, when it announced the new flight test and delivery schedule for the Dreamliner, Boeing also said it would take a \$2.5 billion charge, or \$2.21 a share, in the third quarter to write off the cost of the research and development work on the first three Dreamliners. It is also cutting 10,000 jobs this year, or 6 percent of its work force."

It turned out that there were more problems as the plane caught on fire during its first test flight in 2010. It is now 2011 and Boeing still has not delivered its first 787. Boeing's outsourcing strategy has therefore cost Boeing workers and Boeing stockholders more than \$20 BILLION.

Here are comments from Boeing workers regarding the disastrous outsourcing of the 787:

“Boeing's major problems are arrogance, aloofness, incompetence, lack of integrity among its employees, increasing technical sleaze, lying, misleading, too many incompetent middle managers, horrible absolutely horrible hiring practices, sick corporate MBA culture, almost total lack of ingenuity, cheapness in what matters, mindlessly wasteful, lousy planning and preparation, and treating good engineers like ungrateful children while handing a bonanza to the unqualified. Their sick stifling corporate engineering culture is the last place the problems of a new plane can be solved honestly and accurately because the talent and experience levels are approaching zero. “

“The pinheads in Chicago wanted to cut corners so they could reap more profits. Newsflash geniuses...you get what you pay for. Jimmy M needs to be shown the door and someone with an IQ higher than room temperature needs to be brought in to fix the 787 mess.”

”It just kills me that we pay these people such big bucks to make such stupid decisions!! Back in 2003, when my husband started working on the 787 it was obvious from the get-go that the concept was seriously flawed and wouldn't work and it was not for lack of trying...again and again and again! Boeing gave away the store and now they whine! “

January 2011 Boeing admits 787 outsourcing was a financial failure

In January, 2011, Boeing executives finally admitted publicly that their outsourcing plan cost far more than it would have cost to simply build the planes here in Washington: Boeing Commercial Airplanes chief admitted that this strategy backfired completely — outsourcing cost far more money than it saved, and led to a three year delay in the release of the 787. “We spent a lot more money in trying to recover than we ever would have spent if we'd tried to keep the key technologies closer to home.” Wall Street analysts have estimated that this bad move cost the company between \$12 billion and \$18 billion dollars, on top of the \$5 billion the plane was originally predicted to cost.

<http://politicalirony.com/2011/02/08/boeing-outsourcing-fail-fooled-twice>

2013 November Corrupt Washington Legislature gives Boeing largest state tax break in US history

Despite the fact that corporate tax breaks are unconstitutional in Washington state, and despite the fact that Washington Supreme Court found that the state legislature had violated our State Constitution in failing to fund our public schools, and despite the fact that previous state tax breaks given to Boeing did not create any new jobs – and instead led to massive outsourcing of jobs - in November 2013, Washington Governor Jay Inslee called a special session of the legislature for the sole purpose of granting Boeing another \$9 billion in state tax breaks with no strings attached. After giving Boeing the largest tax break in US history, because there were no strings attached, Boeing continued to lay off another 13,000 jobs between 2014 to 2016. Ironically, at the same time that Boeing was laying off workers, in December 2016, Boeing announced a 30% increase in its quarterly dividend as well as a new \$14 billion share repurchase program intended to drive Boeing stock prices even higher.

Transferring the Tax Burden from the Rich to the Middle Class

The point of all of these state and federal tax breaks is to shift the tax burden away from wealthy corporations and onto the backs of working families. As a result, the percent of federal income tax contributions paid by corporations fell from 32% in 1952 to 10% in 2008. This corporate tax rate is about half of the average corporate tax rate in other developed nations. The Treasury Department estimated the federal revenue loss from corporate tax preferences at more than \$1.2 trillion over the past ten years.

At the same time, big business politicians raised the amount of income taxes raised through payroll taxes on workers' wages, State taxes and “user fees” on everything from public roads to public parks such that the total tax burden on middle class working families rose from 7% in 1952 to 30% in 2008. See Corporate Tax Reform, Center on Budget and Policy Priorities <http://www.cbpp.org/cms/index.cfm?fa=view&id=3411>

Currently, the chief executive of Boeing, Dennis Muilenburg is paid \$23.4 million per year. Meanwhile, the starting pay for workers at Boeing is a mere \$14 per hour.

Bribery as a Business Model

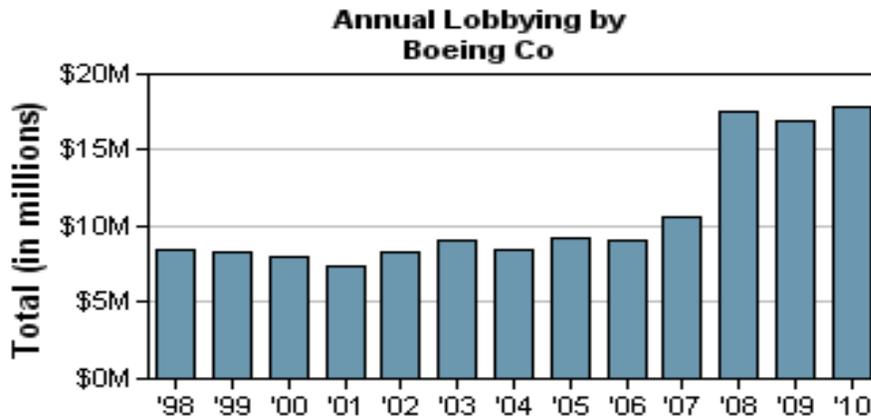
Boeing, like all the major corporations, goes to extraordinary lengths to pay off State and federal politicians in order to maximize its corporate tax breaks. Boeing has an army of lobbyists who swarm the federal and state legislatures to ensure that Boeing's interests are served. The Center for Responsive Politics lists Boeing as number 11 in its list of the 20 biggest financial donors in American politics in 2010. Boeing spends about \$18 million lobbying politicians and providing them with campaign contributions every year. Nearly all of this money went to incumbents in both political parties – recognizing and re-enforcing the principal that incumbents win re-election over 90% of the time. Boeing is an Equal Opportunity corrupter meaning it contributes about equally to incumbents with both political parties. Donations were made to 235 members of the House and 35 members of the Senate.

2010 Federal Lobbying Top Twelve Spenders

Lobbying Client	Total
US Chamber of Commerce	\$132,067,500
PG&E Corp	\$45,460,000
General Electric	\$39,290,000
FedEx Corp	\$25,582,074
American Medical Assn	\$22,555,000
AARP	\$22,050,000
Pharmaceutical Rsrch & Mfrs of America	\$21,740,000
Blue Cross/Blue Shield	\$21,007,141
ConocoPhillips	\$19,626,382
American Hospital Assn	\$19,438,358
Boeing Co	\$17,896,000
National Cable & Telecommunications Assn	\$17,710,000

<http://www.opensecrets.org/lobby/top.php?showYear=2010&indexType=s>

The amount of money Boeing has been spending on lobbying also increased dramatically from 2000 to 2010 - doubling from about \$8 billion to \$18 billion per year:



<http://www.opensecrets.org/lobby/clientsum.php?lname=Boeing+Co&year=2010>

This reflects the general trend of all wealthy corporations to bribe Congress: <http://www.opensecrets.org/lobby/index.php>

Total Lobbying Spending

1998	\$1.44 Billion
1999	\$1.44 Billion
2000	\$1.56 Billion
2001	\$1.64 Billion
2002	\$1.82 Billion
2003	\$2.04 Billion
2004	\$2.17 Billion
2005	\$2.43 Billion
2006	\$2.62 Billion
2007	\$2.85 Billion
2008	\$3.30 Billion
2009	\$3.49 Billion
2010	\$3.49 Billion

Boeing is also a major contributor to Washington State Incumbents. According to the Washington State Public Disclosure Commission, Boeing spent \$350,000 in 2010 bribing incumbents in the Washington State legislature. In addition, Boeing donated up to \$10,000 each to the House and Senate and State Republican and Democratic Committees – all of which are used to re-elect incumbents. Boeing also donated \$75,000 to defeat Initiative 1098 (High Earners Income Tax) and \$100,000 to the Initiative to Privatize Workers Comp. <http://www.pdc.wa.gov>

Boeing works in cooperation with other corporations so that corporate incumbents are often able to outspend non-corporate challengers by a margin of 20 to 1. This is one of the primary reasons that incumbents win re-election over 90% of the time. The other reason is that corporations control the major media – which gives incumbents billions of hidden dollars of media propaganda. For a challenger to win election in a swing Washington State legislative district today costs over \$200,000. To win a Congressional District race costs over \$1 million.

Boeing's 2010 lobbying expenditure for 2009 was \$16.9 million. In December 2011, the non-partisan organization [Public Campaign](#) criticized Boeing for spending \$52.29 million on [lobbying](#) and [not paying taxes](#) during 2008–2010, instead getting \$178 million in tax rebates, despite making a profit of \$9.7 billion, laying off 14,862 workers since 2008, and increasing executive pay by 31% to \$41.9 million in 2010 for its top five executives.

<https://www.webcitation.org/64D9GyQG0?url=http://www.ibtimes.com/articles/264481/20111209/30-major-u-s-corporations-paid-lobby.htm>

Boeing Congressional Payoffs Continue

According to [opensecrets.org](#), in the 2018 election cycle, Boeing spent \$32 million on lobbying and 4.5 million in direct campaign contributions for a total of \$36.5 million in bribes to federal politicians. The corruption was equally divided by incumbents from both major parties. Most of the bribery was hidden behind political action committees. The gravy was divided between 159 Democrats and 183 Republicans in Congress along with 41 Democrats and 27 Republicans in the Senate. The top recipient was Maria Cantwell D WA with \$54 K – not including PAC slush funds. Retired Congressman Norm Dicks WA nickname Mr. Boeing is collecting a cool \$50 K per year from Boeing and other \$50K per year from General Dynamics and retired Senator Dick Gephardt is collecting a cool \$60K per year. According to a [Daily Beast report](#), Boeing's lobbyists made \$827,000 in political contributions in February 2019. The donations, which were reflected in a [recently filed Federal Election Commission report](#), were the most that Boeing has ever donated in a single month to political campaigns. Boeing and their sub contractors donate more than one million dollars per year to political campaigns. For this, Boeing gets more than three billion dollars per year in state and federal tax breaks.

March 30, 2011 WTO finds Boeing received at least \$5 billion annually in illegal State and federal subsidies

http://www.seattlepi.com/business/438020_wto31.html

The US. federal government, states and local governments provided at least \$5.3 billion in [illegal subsidies](#) to [Boeing](#), a World Trade Organization panel found in a [ruling](#) released Thursday.

"Finally the truth emerges: Boeing has received and continues to receive subsidies which have a significantly greater distortive effect than the Reimbursable Loans to Airbus," Rainier Ohler, Airbus' head of Public Affairs and Communications, said in a news release, referring to the main funding mechanism in the earlier case regarding European subsidies to Airbus.

"Taking the cases together, the WTO has now specifically green-lighted the continued use of government loans in Europe and ordered Boeing to end its illegal cash support from US. taxpayers. It's time for Boeing to stop denying or minimizing the massive illegal subsidies it gets."

In the Boeing case, the EU asserted that the US. plane maker got an estimated \$19.1 billion in illegal subsidies between 1989 and 2006. This included \$10.4 billion in NASA research and development subsidies and the export benefits. In addition to the prohibited export benefits (found to be \$2.2 billion to Boeing), the WTO panel found these were improper subsidies: NASA research and development funding, and access to facilities, equipment and employees (\$2.6 billion).

November 28 2016 WTO again finds Boeing Tax Breaks are Illegal

<https://leehamnews.com/2016/11/28/airbus-boeing-claim-victory-todays-wto-ruling-washington-state-tax-breaks/>

"Today's report from the World Trade Organization (WTO) Panel (DS487) confirms that the United States has ignored international trade rules by permitting illegal subsidies to Boeing, this time targeted at the 777X aircraft," Airbus said in a press release

Washington's \$8.7bn in tax breaks were specifically tied to the 777X, the WTO found, in violation of its rules, according to Airbus.

March 28 2019 WTO again finds Boeing federal and state tax breaks were violations of WTO trade rules

Final WTO ruling says Boeing's Washington state tax breaks are illegal. A final ruling from the World Trade Organization (WTO) published Thursday in Geneva left standing its decision from 2017 that the major part of the Washington state tax breaks to Boeing are illegal subsidies. Delivering the final word in a nearly 14-year standoff, the WTO appeal panel didn't change the previous finding that the state's Business & Occupation Tax breaks damaged airplane sales by European arch rival Airbus.

A reduced B&O rate was set by the Legislature in 2003 to persuade Boeing to build the 787 Dreamliner in the state. The decision by the WTO's appellate body considered whether the United States had complied with a 2012 ruling that found Boeing received at least \$5 billion in subsidies banned under international trade rules. The WTO ruling found that the Washington state tax break had led to lost sales of Airbus' A320neo and A320ceo aircraft in five sales campaigns. The WTO's Appellate Body, effectively the supreme court of world trade, ruled that the business and occupancy (B&O) tax rate reduction in Washington state had significantly cut Airbus sales in five particularly price-sensitive sales campaigns.

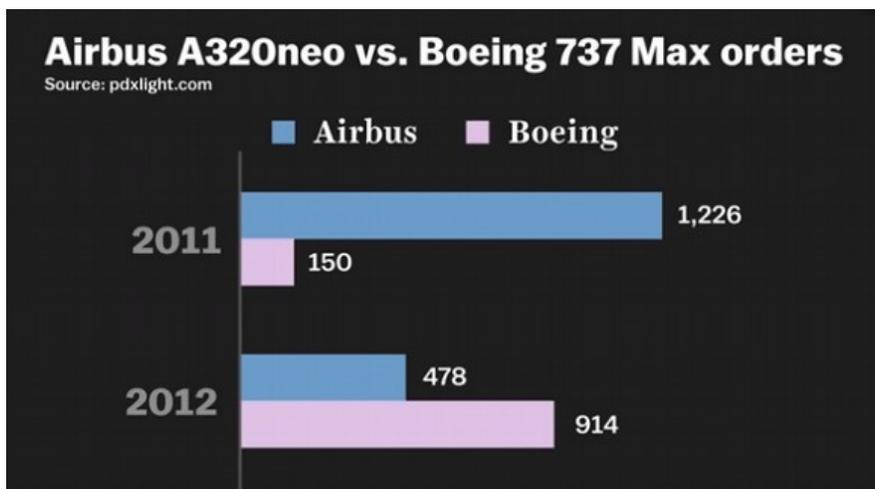
By the end of 2010, Boeing workers had been subjected to wave after wave of layoffs due to outsourcing schemes that cost Boeing billions of dollars. Boeing leaders had committed countless crimes using bribery and blackmail to obtain billions of dollars in illegal tax breaks from Washington state and the US government. These billions in tax breaks were literally robbing one million school children in Washington state of an education. Yet none of these crimes could compare to what was about to come next – the Boeing decision to create the 737 Max.

2011 to 2019 Greed Finally Catches Up to Boeing

On December 1 2010, Airbus announced the A320 Neo a more fuel efficient single aisle plane at a time of increasing jet fuel costs. The neo sold very well in its first few months. On July 20, 2011, a major Boeing customer, American Airlines announced the purchase of 460 planes. 260 would be Airbus and only 200 Boeing.

Even with this, the 200 Boeing planes were required to have more fuel efficient engines – even though there was no more room under the wings of the 737 NG.

This was the beginning of the 737 Max. The Boeing promise to build a 737 with a bigger engine even though it was technically impossible worked – at least in terms of generating orders. While the Airbus A320 NEO dominated orders in 2011, the Boeing 737 Max dominated orders in 2012:



The celebration at Boeing was short lived as since 2012, the A320 NEO has become more popular than the 737 MAX:

Orders	2013	2014	2015	2016	2017	2018
737 MAX	708	891	409	530	759	720
320 NEO	873	1009	887	711	925	562

Notes: The 320 NEO orders include the 321 NEO and the 737 MAX orders include all versions of the MAX. Also note that while Airbus has gotten orders for hundreds of A320 NEOs in 2019, Boeing has not sold a single 737 MAX in 2019. Instead, they have had hundreds of orders canceled.

https://en.wikipedia.org/wiki/List_of_Airbus_A320neo_family_orders_and_deliveries

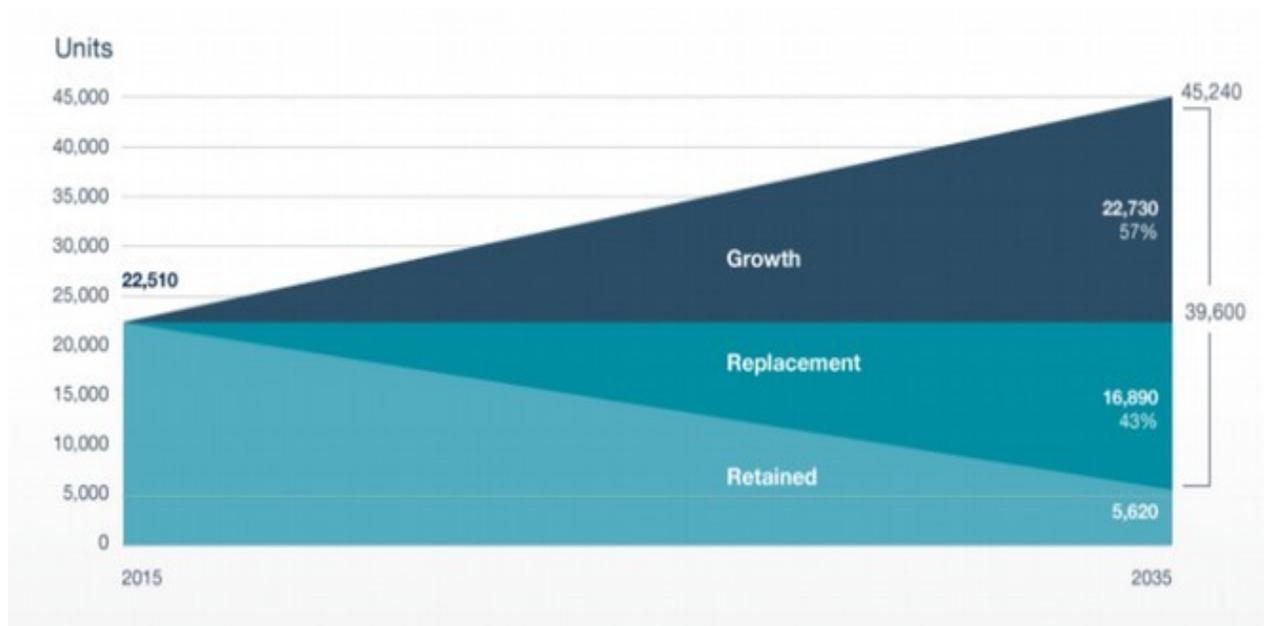
Airbus has also been able to deliver twice as many planes as Boeing:

Deliveries	2016	2017	2018	2019	Total
737 MAX	0	74	256	46	376
320 NEO	68	181	386	143	778

60 A320 NEOs are made every day in four plants around the world (France, Germany, China and Alabama). Meanwhile, currently 42 737 Max planes are made every month in Boeing's Renton factory

This presentation indicates there will be a need for 40,000 new commercial airplanes in the next 20 years (2,000 per year)

<https://alacpa.org/pdfs/2016-DIA%20%20PDF/5-Yonglian-ALACPA%20Presentation%2029%20Nov%202016.pdf>



The total orders for Max and Neo planes over the next 10 years is more than 20,000 planes worth more than two trillion dollars. Before the design problems were exposed, it was expected that Boeing would get half of this market or one trillion dollars. However, once another Boeing 737 Max crashes, it will likely get nothing and the entire market will go to Airbus.

The first Max delivery was May 6, 2017. The first Boeing 737 Max crash occurred on October 29, 2018. The second Max crash occurred on March 10, 2019 – less than 2 years after the Max was first delivered – for an average of one Max crash every year. In the next section, we will estimate how long it will take before Boeing is out of business.

8 The Thin Line from Financial Success to Financial Disaster

We ended the last session by estimating that the Boeing 737 Max disaster might cost Boeing a trillion dollars or more in new orders. In this section, we will provide evidence that this is a hit Boeing cannot afford to take. All it will take is one more Boeing 737 crash and it is likely that Boeing will be forced out of business.

On January 30, 2019, Boeing reached a financial high water mark. They reported record revenue of over \$100 billion in 2018 with more than \$10 billion in profit:

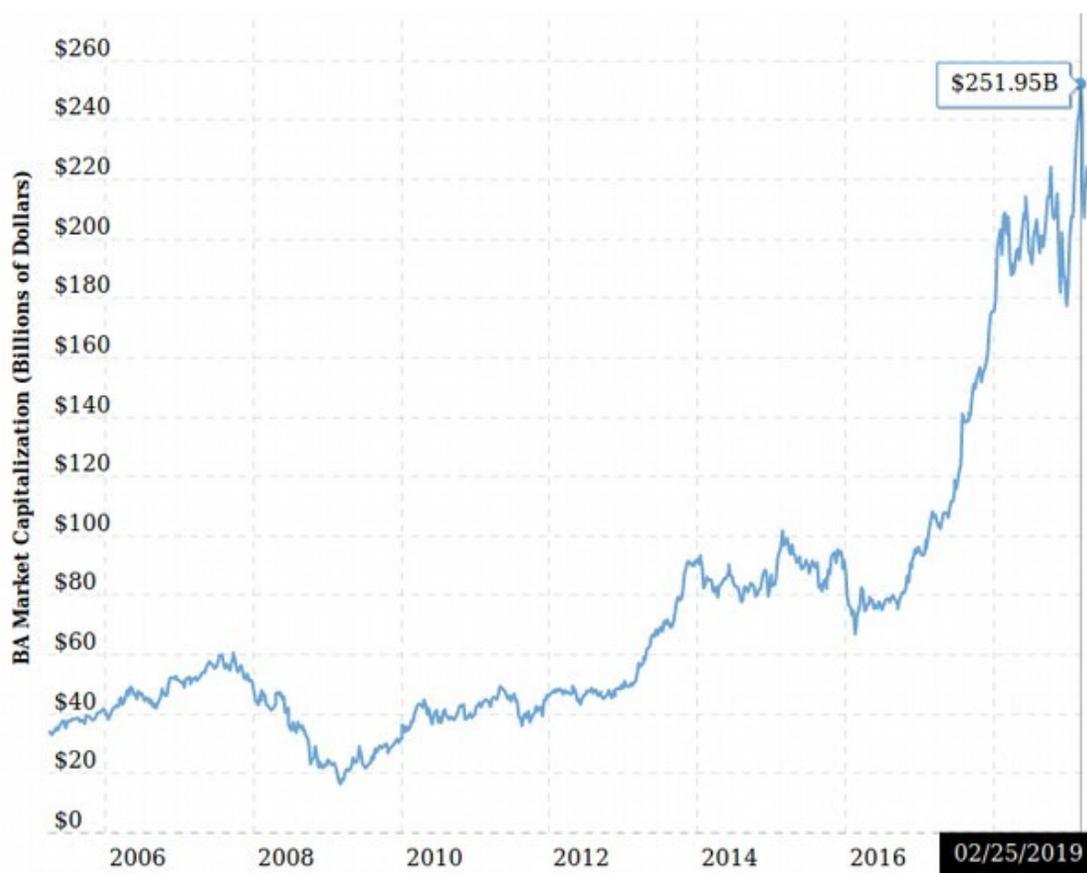


This was a 50% increase over the 2011 revenue of \$50 billion. Three months later, on April 30, 2019, it was reported that **Boeing not only had no new orders for the 737 Max, they had not a single order for any of the other models of their airplanes.** Instead, they were hit by a series of whistle blowers who alleged that Boeing had huge quality control problems on many models of their planes including the new 787. They were also hit by a series of lawsuits – not only from the families of the Indonesian and Ethiopian crashes but from investors who lost billions due to the plunge in Boeing stock. Investors claimed correctly that Boeing knew about the 737 Max problems but failed to disclose them not only to the FAA and to pilots but also to investors. Boeing **stock price**

quadrupled. Its executives personally made tens of millions of dollars in bonuses, thanks, in large part, to the record-setting pace of 737 Max sales.

Here is the stock price and valuation charts during the time of this deception. Boeing market cap history and chart from 2006 to 2019. Market capitalization (or market value) is the most commonly used method of measuring the size of a publicly traded company and is calculated by multiplying the current stock price by the number of diluted shares outstanding. Boeing market cap as of May 15, 2019 is **\$202 B**.

<https://www.macrotrends.net/stocks/charts/BA/boeing/market-cap>



This \$200 billion valuation increase since 2016 was based almost entirely on the orders Boeing had to produce about 5000 737s during the next few years. Boeing reached a maximum value of **\$252 billion in February 2019** – meaning that since the second 737 crash, their investors have lost about \$50 billion. It is pretty obvious that if the 737s orders are canceled, Boeing stock price will fall

back down to \$40 billion or even lower – for a loss to investors of more than \$200 billion.

Here is the related stock price history:



The latest stock price for Boeing as of May 15, 2019 is **355**. The all-time high Boeing stock price was **440 in February 2019**. **The loss to investors since February has been about 20%. If (or when) the Boeing 737 orders are canceled, the Boeing stock price will fall back down to the pre-737 Max days of just \$50 per share – for a loss to investors of about 90%.**

Since the two crashes, Boeing has lost over \$50 billion in market cap. It may have to pay billions more to its suppliers and airline customers for costs related to the grounding, and that's not including the nearly [\\$30 billion](#) in orders that airlines have threatened to cancel. All this for an airplane whose initial development was supposed to be a great value at only [\\$3 billion](#).

At a Boeing financial call on April 24, 2019, Boeing stated that they were losing money at a rate of one billion dollars per month. This claim was based entirely on the fact that Boeing had reduced production of 737 Max from 52 planes per month to 42 planes per month. Since each plane sold for \$100 million, 10 times \$100 million is a loss of one billion dollars per month.

But actual Boeing losses were much greater than this because Boeing was not actually selling ANY of the 42 planes it was making each month. Instead, these planes were sitting at airports all over Washington state. The true loss was \$100 million per plane times 52 planes equals \$5.2 billion per month.

At the April 24, 2019 conference call, Boeing also claimed that it had over 6 billion dollars in the bank. This implied that Boeing could sustain over 6 months of losses (at a loss of one billion per month) due to the 737 Max disaster before they would face bankruptcy. Boeing assured investors that the 737 problem had already been solved and that 737s would be back in the air in less than 3 months.

Boeing financial leaders clearly knew that they had under-stated their financial problems because less than one week later, on April 30, 2019, Boeing arranged for an additional \$3.5 billion in unsecured corporate bond offerings and a \$1.5 billion line of credit from three different US banks. Proceeds of the sale will be used for “repaying debt, buying back stock, acquisitions and capital expenditures.” <https://www.marketwatch.com/story/boeing-gets-liquidity-boost-from-35-billion-bond-sale-2019-04-30>

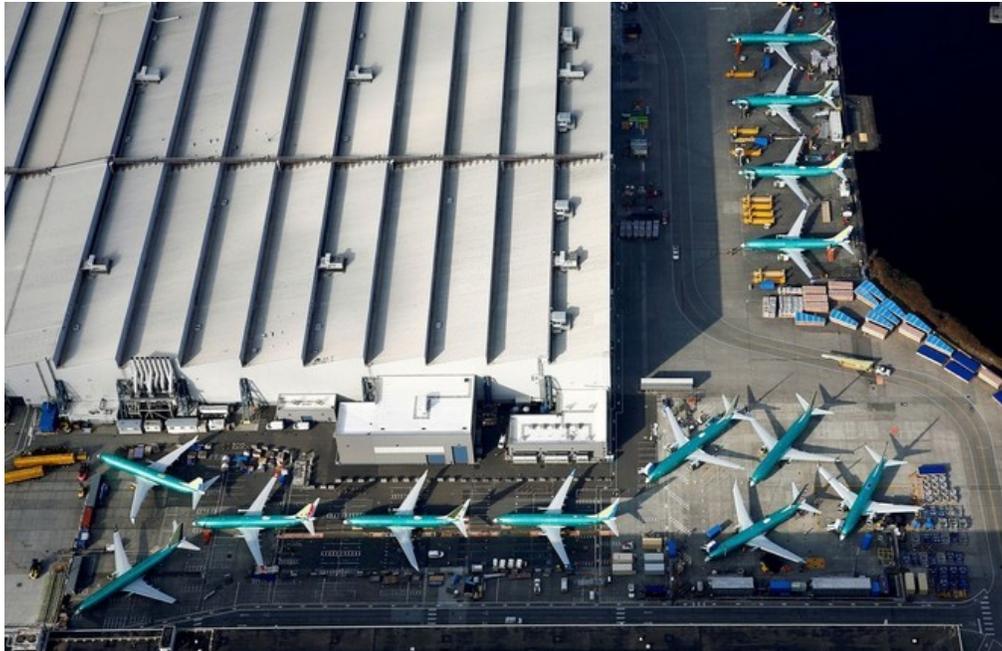
On the surface, this would appear to give Boeing \$10 billion in cash to weather the storm. However, Boeing has payments to make on previous bonds of about one billion by the end of the year. This huge interest payment is because Boeing already had \$15.5 billion in debt which included \$1.5 billion in debt it took on in February before the second fatal crash. Adding \$5 billion in new debt increases Boeing’s total debt to more than \$20 billion. As of March 31, 2019 Boeing had \$3.4 billion of debt maturing within the next 12 months, including short-term debt and commercial paper.

Plus, in order to keep their stock price from collapsing, Boeing needs to pay a dividend of more than one billion. So, after subtracting the billion dollar dividend and billion dollar debt payments, Boeing actually has about \$8 billion to cover the losses from 737 cancellations. The question is whether \$8 billion will be enough to keep Boeing afloat (or aloft). In this section, we will explain why \$8 billion – or really any amount of money – is not likely to save Boeing.

First, let’s look more closely at why Boeing said it was losing one billion per month. Boeing cut production of planes from 52 per month to 42 per month.

Since each plane sells for about \$100 million, and since most of this payment is made when a plane is actually delivered, a reduction of 10 planes per month is a loss of one billion dollars per month.

But this claim that the loss is only one billion per month is based on the assumption that Boeing will be able to deliver the other 42 planes per month that are currently sitting on runways in airports all over King County. Here is a picture of 13 737 max airplanes parked in Renton



About 30 are parked at Boeing field in Seattle



Here is another parking lot at Boeing field in Seattle:



About 20 more are at Paine Field in Everett



At 42 planes per month times at least four months before the FAA approves these planes, Boeing is going to have to find parking spaces for 168 more additional planes. Counting those Boeing has already built, this will make an inventory of about 300 unsold planes - \$30 billion in unsold planes.

But what if carriers do not want to take deliver of these planes. What if passengers find out how unstable these planes are? A poll conducted by [Business Insider](#) noted that 53 per cent of American adults never want to fly on a 737 Max, even if the FAA says the plane is safe. They clearly do not trust either Boeing or the FAA. Aviation industry analyst Henry Harteveldt stated:

"Passengers are afraid of this airplane. I haven't seen anything like this in decades, in terms of consumer fear and desire to avoid flying on the 737 Max."

Airlines have already bought hundreds of 737 Max planes which they will likely try to put back in service later this summer. If they cannot convince people to fly on the planes they already have – then what will happen to the \$30 billion in unsold Boeing planes stacking up all over Washington State?

To make matters worse, the real cost of the Boeing disaster is likely to be much more than one billion dollars per month. On April 3, 2019, JP Morgan analysts estimated Boeing monthly losses could be as high as \$2.7 billion per month. Even if the losses are only two billion per month – Boeing could be bankrupt in just as little as four months.

<https://www.bloomberg.com/news/articles/2019-04-03/boeing-s-financial-risk-deepens-as-737-max-factory-dilemma-looms>

Because Boeing would fail in about 4 months and because Boeing is too big to fail, it is almost certain that the FAA will be forced to certify the 737 Max as safe in less than 4 months – likely by the end of August 2019. Boeing and airline carriers will then likely begin the biggest promotion in history declaring the 737 to be the “safest plane that has ever flown.”

But the worst problem for Boeing will come AFTER the FAA certifies that the 737 is safe to fly again. It is almost certain that another Boeing airplane will crash in the following months – perhaps in part due to high winds, heavy rain and poor visibility. When the third crash comes, that will be the end of the line for the 737 max and perhaps the end of the line for Boeing. This is why I predict that Boeing will inevitably go broke.

Latest Shocking News

Here is the latest shocking news.

March 24 2019: Indonesia's largest air carrier has informed Boeing that it wants to cancel a \$4.9 billion order for 49 Boeing 737 MAX 8 aircraft. Garuda Indonesia spokesperson Ikhsan Rosan said in a statement to [the Associated Press](#) that the airline was canceling due to concern that “its business would be damaged due to customer alarm over the crashes.”

April 9 2019: China Aircraft Leasing Group Holdings (CALC) has put its order for 100 Boeing 737 MAX jets on hold until it is assured of the aircraft's safety. The Hong Kong-listed lessor, controlled by the state-owned conglomerate China Everbright Group, placed an order for 50 737 Max in June 2017. CALC then increased it by another 25 in December 2017 with an option for 25 more as part of its plan to grow its overall fleet from 133 in 2018 to 232 by 2023. According to the original schedule, the first MAX jet was expected to be delivered to CALC in the third quarter of this year 2019 and continue up to 2023. "The purchasing procedure has been temporarily put on hold and we have stopped the payments" because the matter is being worked out with the aircraft manufacturer, said Chen Shuang, chairman of CALC and chief executive of China Everbright, the financial arm of China Everbright Group. The order for the first 50 aircraft was valued at US\$5.8 billion.

[China](#) is also looking at excluding [Boeing Co.](#)'s troubled 737 Max jet from a list of American exports it would buy as part of a trade deal with the US., people familiar with the matter said. Boeing jets were featured on a draft list of American products China would buy to reduce its trade surplus with the US., the people said, asking not to be identified discussing private deliberations. Now, safety concerns are pushing China to examine whether to cut the 737 Max from the list altogether or replace it with other Boeing models after the crash of a plane operated by [Ethiopian Airlines](#) led to the aircraft being grounded worldwide, they said. For Boeing, China's exclusion of Max purchases in a trade deal would mark another setback for a company that's reeling from a crisis of confidence over its **top-selling plane, which accounts for almost a third of its operating profit**. No other country has more demand for aircraft than China, which is estimated to seek 7,690 new planes worth \$1.2 trillion in the 20 years through 2037, according to Boeing's latest forecast.

But instead of ordering Boeing planes, on March 26, 2019, China ordered 300 Airbus A320 NEO planes. The deal was signed as Chinese President Xi Jinping visited France's Emmanuel Macron in Paris. No value was announced, but the pre-discount list price for the order is [roughly \\$35 billion](#). Airbus's shares rose more than 2% on the news. Almost all the planes—290 of the 300—are in Airbus's single-aisle A320 family.

In addition, Airbus is working closely with China on an Airbus factory in China.



Second, on April 27, about a dozen former and current Boeing employee “whistle blowers” claimed that Boeing suffered from numerous safety violations – violations affecting not only the 737 but several Boeing planes.

Third, on April 28, 2019, the Wall Street Journal published an official statement from Southwest Airlines admitting that for more than one year (between 2017 and October 2018) Boeing had secretly turned off stabilization “warning lights” in 737 cockpits without telling either Southwest Airlines management or pilots. Southwest Airlines is (or was) one of Boeing’s largest customers. This meant that the only reason Southwest Airline flights did not suffer the same fate as the two doomed flights is that Southwest Airlines has better, more experienced pilots than the doomed flights.

Fourth, on April 29, 2019, Boeing admitted that they had even more software problems (in addition to the additional problems they admitted to on April 4 2019). In fact, the real problem is an unfixable design problem which Boeing tried to cover up with several software band-aids – none of which can address the real danger in the flawed Boeing design.

Fifth, on May 15 2019 the House held a hearing on the Boeing 737 MAX.

House Transportation and Infrastructure Committee Aviation Sub Committee hearing status of the Boeing 737 max May 15 2019

The House committee was so bought and paid for by Boeing that Boeing executives were not even required to attend. Not only did Boeing not have to testify, they failed to supply a single document requested by the House Committee. Result? No problem.

Rick Larson is the chair of this committee How much did Rick get from Boeing? \$10,000.

Peter DeFazio, who heads the full Transportation Committee, said Boeing hasn't yet provided documents that he and Larsen requested. "Boeing has yet to provide a single document," he said. "We've got to get to the bottom of this." DeFazio also got \$10,000 from Boeing.

FAA acting chief Daniel Elwell was critical of Boeing for not disclosing to the FAA or to airlines for more than a year that a 737 Max display supposed to show whether a sensor was malfunctioning wasn't functional. "I think that's an issue, sir," Elwell said under questioning by DeFazio. "It shouldn't take a year for us to find out." Elwell also admitted that the FAA certifiers were paid by Boeing.

Shockingly, Elwell had no idea about the real power of MCAS.

Congressman Cohen: "Media reports indicated that Boeing underestimated the capability of MCAS by a magnitude of four times in its submissions to the FAA and the FAA only found out about this in Boeing's notice to airlines explaining MCAS after the Lion Air Accident. For the record, can you confirm this account and if it is not correct, please clarify the timeline?"

Elwell: I will get an answer for you. I am not familiar with it.

Representative Norton stated: "Our purpose is to restore confidence in our system."

Representative Mitchell stated. "I have faith in the FAA and I have faith in Boeing. We have to trust our aviation system. "

Why the FAA will approve the Boeing Patch even if they know it will not work... Meet Ali Bahrami

Ali Bahrami is now the FAA's associate administrator for aviation safety. But six years ago Bahrami worked for the aircraft manufacturers lobby, and he argued before Congress to fight foreign competition by delegating more regulatory authority to the plane-makers to help them get new products to market faster. Now he'll be the one to sign off on the Max's band-aid



Airline Carriers are already hiding the fact that you may be inadvertently put on a 737 Max

Consumers who want to avoid flying Boeing 737 Max jets after they return to the skies could still unknowingly book flights scheduled for those models. A review of flights scheduled on Max planes in the fall of 2019 found airline websites do not clearly identify which aircraft model passengers will be flying on, according to two primary sources of airline schedule data, [Diio Mi](#) and [ch-aviation](#). For example, the airline websites showed:

American Flight 1201, scheduled for Sept. 8 from Miami to Boston on a Boeing 737 Max 8, had no equipment type listed, which is unusual because American typically lists aircraft types for its flights

- For that same day, United Flight 1046 from Houston to Las Vegas, was scheduled on a Max 9, but showed simply a "Boeing 737," which is unusual because United typically lists the specific type of 737
- And Southwest Flight 5407 from Fort Lauderdale to Chicago, scheduled on a Max 8, showed a "Boeing 737-800"

However, the online search site Kayak did indicate Max planes would be used for those same flights, as did TripAdvisor's SeatGuru site. For all three, Kayak and SeatGuru indicated Max jets: Max 8s for American and Southwest, Max 9s for United.

Although by custom, airlines publish the aircraft type scheduled to operate a flight, a US. Department of Transportation spokesperson couldn't immediately verify whether the department requires these disclosures, or whether missing or incorrect aircraft information violates any DOT rules.

Officials at American and United airlines told *Here & Now* that their systems will be updated so that customers will be able to see if a Max is scheduled on any given flight. By Wednesday morning, United's website was updated to correctly show, for example, that a Max 9 is scheduled for Flight 1046 on Sept. 8. Southwest did not respond to requests for comment.

<https://www.wbur.org/hereandnow/2019/04/24/boeing-737-max-web-searches>

Here are the airlines to avoid if you want to avoid flying on the 737 Max:

Southwest Airlines, ordered 280 of the planes and has 36 in its fleet.

United Airlines, ordered 137 of the planes and has received 14.

American Airlines, ordered 100 of the planes and has 24 in its fleet.

Southwest lost more than \$200 million in revenue during the first quarter and has taken its 34 MAX aircraft out of the company's flying schedule through Aug. 5.

American Airlines extended its Max cancellations through Aug. 19, 2019 saying it was confident the aircraft will be recertified to fly before then.

Here is a pile of Southwest 737 max airplanes just waiting for FAA approval to start flying again:



Even if the 737 Max is certified in August, the real question is whether passengers will be willing to serve as hostages by flying in 737 Max planes with a band-aid placed on MCAS.

9 Questions for 737 Max Lawsuit Depositions

There are currently more than 30 lawsuits against Boeing. Some of these lawsuits have been brought by victims of the two plane crashes and others have been filed by share holders who were clearly deceived into buying Boeing stock on the false claim that the 737 Max was a safe plane. Some have estimated that these lawsuits will cost Boeing more than one billion dollars. In fact, once airline carriers start suing Boeing for selling them one thousand defective airplanes at a cost of one hundred million dollars each, **the lawsuits will eventually cost Boeing more than one hundred billion dollars.** These huge and unpayable losses will cost Boeing the loss of another hundred billion in declining stock prices and likely cause Boeing to go bankrupt.

While one purpose of all of these lawsuits will be to provide victims of Boeing corruption some financial compensation, another and perhaps even more important purpose will be to determine what the leaders of Boeing knew and when they knew it as well as who made the deadly decision to move the new LEAP engines above the wing and who made the deadly decision to change MCAS from 0.6 degrees to 2.5 degrees with a repeat function.

Attorneys for the plaintiffs will be allowed prior to the trials to ask Boeing executives questions that thus far Boeing has refused to answer. These questions should include the following:

25 Questions to ask during Deposition and release to the public

#1 How many inches forward and how many inches up were the new LEAP engines moved on the 737 MAX in comparison to the position of the 737 NG engine on the 737 NG?

#2 Did this move increase the distance between the center of lift and the center of gravity?

#3 If yes, what was the distance between the Center of Lift and the Center of Gravity on the 737 NG and what was the distance between the Center of Lift and the Center of Gravity on the 737 MAX during a normal takeoff and ascent?

#4 Did any Boeing engineers ever express a concern that increasing the distance between the center of lift and the center of gravity might increase instability during or after takeoff?

#5 What is the distance of the 737 Max LEAP engine off the ground when the plane is fully loaded with fuel and passengers compared to the prior 737 NG Engine?

#6 What is the diameter of the 737 Max LEAP engine compared to the diameter of the prior 737 NG engine?

#7 At the highest point of the engine, how many inches is the new 737 Max LEAP engine below the top of the wing at the highest point of the engine compared to the prior 737 NG Engine?

#8 At the highest point of the engine, how many inches in front of the wing is the engine of the 737 Max compared to the prior engine on the 737 NG?

#9 At an angle of attack of 15 degrees, how many inches above the wing is the highest point of the 737 Max LEAP engine?

#10 At an angle of attack of 15 degrees, how many inches above the wing was the highest point of the prior 737 NG engine?

#11 Given that the surface area of the 737 Max engine above the wing was much greater than the surface area of the 737 NG engine above the wing, did any Boeing engineers ever express a concern that placing the engine above the wing might create turbulence over the wing leading to instability during or after takeoff?

#12 What did Boeing managers know about the instability of the Boeing 737 Max and when did they know it?

#13 Did Boeing do wind tunnel testing with a model of the 737 Max?

#14 When did Boeing decide to add MCAS to the 737 Max?

#15 How did Boeing calculate that a value of 0.6 degrees of tail flap adjustment would be enough to make the Max feel like the former 737 NG and or prevent a stall?

#16 Was this calculation based on a computer analysis or computer simulations? If so, on what data or computer program or computer simulation was this calculation based?

#17 When and who decided to change MCAS from 0.6 degrees of adjustment to 2.5 degrees of adjustment?

#18 Who made this change from 0.6 degrees to 2.5 degrees?

#19 What was the field data that led to this change?

#20 Was this change made after doing mandatory FAA anti-stall maneuvers with the real 737 Max in 2016?

#21 When was the decision made to add an infinite loop repeat function to MCAS?

#22 Who made this decision to add an infinite loop to MCAS and why was it made?

#23 When was this decision to increase the magnitude of the MCAS adjustment and add an infinite loop communicated to the FAA?

#24 When was this decision to increase the magnitude of the MCAS adjustment and add an infinite loop communicated to carriers?

#25 When was this decision to increase the magnitude of the MCAS adjustment and add an infinite loop communicated to carrier pilots?

On April 4 2019, law firms in the US [filed the first wrongful death claim](#) on behalf of a US national Sanya Stumo, against Boeing. Sanya Stumo, who died in the March crash, was a grand niece of public safety advocate and US presidential candidate Ralph Nader.

While this is a huge tragedy for the Nader family, the involvement of Ralph Nader, may help bring the facts to the public regarding what Boeing managers knew and when they knew it. Ralph Nader is without a doubt one of the most honest and courageous people in America. He has spent his entire career standing up for public safety and opposing corporate and government corruption. If there is any person in America who can actually hold a giant corporation accountable for their actions, it is Ralph Nader.

Here is a picture of Sanya Stumo, age 24:



Those who knew Samya Stumo said her altruistic nature and deep care for humanity drove her into the field of medical anthropology. Stumo, 24, was among 157 killed in the crash of an Ethiopian Airlines plane minutes after takeoff from Addis Ababa, Ethiopia.

"She was compassionate from the get-go," said her great-uncle, Ralph Nader. "She'd be 8 years old and she'd get a pail of hot water and go to her great-grandmother and soak her feet and rub her feet and dry them. She was always that way."

In an statement, both parents wrote that Stumo was "a fearless, radiant spirit who inspired others to live brightly and fully," and "cared most about treating all people and patients as human beings, particularly in the context of their culture, family, and individuality."

Ralph Nader had dinner with Samya Stumo the Friday before she died. When the plane crashed, Stumo was headed to Kenya as an analyst for the global health organization ThinkWell. She was there to set up offices for a project to make health care more affordable in Africa.

While most victims of the two Boeing crashes will likely settle out of court, it is likely that the Nader family will force Boeing to go to a public trial where **the truth can finally come out about what happened.**

Here is a link to the 52 page complaint from the Nader/Stumo family.

<https://www.cliffordlaw.com/wp-content/uploads/2019/04/Anushka-Dixit-Complaint.pdf>

Here are the names and email addresses for the attorneys involved in the Nader Illinois lawsuit. If you are a whistle blower, with information about Boeing, you should contact these attorneys.

Robert A. Clifford, Kevin P. Durkin, Tracy A. Brammeier

rac@cliffordlaw.com

kpd@cliffordlaw.com

tab@cliffordlaw.com

They are working with these San Francisco attorneys: jcotchett@cpmlegal.com, fpitre@cpmlegal.com, acordova@cpmlegal.com, jthyken@cpmlegal.com

Here is another attorney suing Boeing:

Senior Trial Attorney | Senior Partner | Vice President | Board Certified Civil Trial Advocate & Civil Pretrial Practice Advocate | Pilot
RGoldman@BaumHedlundLaw.com

“Two highly-experienced, professional pilots could not recover from what appear to be out-of-control stalls, facts which reveal the most probable explanation for both the Lion Air crash and this crash is a design defect in the airplane’s stall recognition and recovery systems,” [says board-certified trial attorney, Ronald L.M. Goldman from the law firm of Baum, Hedlund, Aristei & Goldman](#).

“Before more people die, the B737 MAX fleet must be grounded until the NTSB gets to the bottom of the problem and Boeing fixes it. Two disasters within months of each other from the same brand-new plane under similar circumstances should be a serious red flag.”

If you lost a loved one in the crash of Ethiopian Airlines Flight 302, the law firm of Baum, Hedlund, Aristei & Goldman can help you.

Here is information about other lawsuits filed against Boeing:

A search of court documents and news reports shows the company is facing at least 34 claims from victims' families and one claim seeking class certification on behalf of shareholder. At least 29 wrongful death claims have been filed in U.S. courts against Boeing on behalf of victims of the Lion Air crash that killed all 189 people on board. At least five U.S. lawsuits have been initiated over the Ethiopian Airlines crash that resulted in the deaths of all 157 passengers and crew.

A lawsuit was filed by shareholders called **Seeks v Boeing Co** et al, U.S. District Court, Northern District of Illinois, No. 19-02394. Here is a link to the complaint:

<https://games-cdn.washingtonpost.com/notes/prod/default/documents/92cf559d-b1ef-4c8a-881b-4051ac75886a/note/5c70c8b9-bc83-473f-ac6c-e12ae6c10214.pdf#page=1>

Lead plaintiff Richard Seeks filed the lawsuit in a Chicago federal court seeking class-action status against Boeing after the crashes of Lion Air Flight 610 on Oct. 29 and Ethiopian Airlines Flight 302 on March 10. The lawsuit claims Boeing concealed the risks of the 737-Max design, including "the danger of the increased pitchup tendency of the aircraft. The complaint says the company '[actively concealed](#)' the nature of the defects," the Associated Press reports.

Here is information on a fourth lawsuit:

Citing "corporate greed" and "serious misconduct," the family of an American man who died when an Ethiopian Airlines plane crashed last month filed a lawsuit against Boeing, the manufacturer of the 737 Max aircraft. The lawsuit was filed in U.S. District Court in Chicago, where Boeing is based, on behalf of the family of **Mucaad Hussein Abdalla**. It is one of a growing number of claims against the company in the wake of two deadly crashes involving the 737 Max.

"In my decades of representing families of the victims of air crashes, I have never seen a case with such serious misconduct by an aircraft manufacturer," said **Floyd Wisner**, one of several Houston-based attorneys representing the family.

Here is information on a fifth lawsuit:

The family of 31-year-old **victim, Jackson Musoni**, a Rwandan man who died in the Ethiopian crash, filed a wrongful death lawsuit claiming Boeing's MCAS system was defectively designed. [Steven C. Marks](#), the lawyer who filed Musoni's complaint, criticized the certification process for the 737 Max 8, saying it amounted to an "amendment" of a 50-year-old model rather than a more rigorous approval process for a "new aircraft." Musoni was one of 19 U.N. aid workers and staffers who were on board Flight 302, many of whom were traveling to Nairobi for the U.N. Environment Assembly.

Attorney Kevin Durkin, who specializes in plane crash cases, said that if Boeing knew of a defect in the 737 Max fleet before the crash, its potential liability would go up sharply — beyond just compensation for victims' families for their losses. "If you have a defective product and it turns out Boeing knew about it this could easily expose them to punitive damages," said Durkin, a partner with the Chicago's **Clifford Law Offices** who isn't involved in the Lion Air litigation. "The standard is whether they acted with a 'conscious indifference' to the safety of others."

Dozens of suits over the Lion Air crash are already pending in Chicago federal court. Families of 11 Lion Air victims said at a news conference organized by **Jakarta law firm Kailimang & Ponto** that they are joining dozens of other Indonesian families in filing lawsuits against Boeing.

"Liability will not truly be in dispute here. Boeing is at fault. Their equipment failed. Their planes crashed twice," **Mark Lindquist, an attorney with the Herrmann Law Firm** who is representing the families of 26 victims of the Lion Air crash, told Yahoo Finance. The Herrmann Law Group filed a claim on behalf of 17 Lion Air crash victims in King County, Washington, where Boeing is headquartered and where its 737 Max 8 is manufactured. The case, since moved to the federal district court for the Northern District of Illinois, now includes 24 families. The Herrmann firm expects to add two more victims to the litigation.

"Very few have been filed thus far," **Thomas Demetrio, a plaintiff's attorney** who has represented the families of multiple air crash victims, including those of Lion Air crash victims, told Yahoo Finance. "I'm sure there will be more to come."

Demetrio said he is waiting to hear the outcome of the FAA and international investigations before filing a complaint on behalf of victims of the Ethiopian Airlines crash.

The estate of **victim, Rohmanir Pandi Sagala**, who died in the Lion Air crash filed a federal lawsuit in the US. District Court for the Northern District of Illinois. The father of Indonesian man, Dr. Rio Nanda Putrama, filed a wrongful death lawsuit in the Circuit Court of Cook County.

Deceased Lion Air passengers **Rudi Roni Lumbantoruan and Remand Ramadhan** are represented by their families who also filed wrongful death actions on behalf of their estates in federal district court in the Northern District of Illinois.

Lion Air co-pilot, Harvino, who died in the Java Sea crash, is represented in a lawsuit filed by his family in December.

A similar action was filed by siblings of a 29-year-old engineer, **George Kabau**. **Kabau's** family hopes that by filing an action Boeing will be forced to release documents, including communications, concerning its 737 Max aircraft model.

Another case is *Debets v. Boeing Co.*, 1:19-cv-02170, U.S. District Court, Northern District of Illinois (Chicago).

According to the Wall Street Journal, a Washington DC. grand jury issued a March 11 subpoena requesting emails, correspondence, and other messages from at least one person involved in the development of the aircraft.

"It's a very, very serious investigation into basically, was there fraud by Boeing in the certification of the 737 MAX 8?" Arthur Rosenberg, an aviation attorney who is representing six families whose relatives died in the Ethiopian Airlines and Lion Air crashes, explained.

"Nobody knows the answer to that yet," Rosenberg cautioned, adding that he had not yet seen the Justice Department's subpoena and therefore could not know its full scope. Rosenberg expects the criminal probe to question whether Boeing fully disclosed to the FAA the engineering of the 737 Max 8's MCAS flight control system, called MCAS (Maneuvering Characteristics Augmentation System), during the plane's certification process.

Don Worley, of the McDonald Worley firm in Texas, says several people have reached out to him with regards to assessing individual cases.

WHAT YOU CAN DO IF YOU LOST A LOVED ONE

If you are the spouse, parent, or sibling of a loved one lost in the Ethiopian Airlines crash, we urge you to contact an aviation lawyer. For more information on what you can do, talk to the [airplane accident lawyers](#) at Pintas & Mullins Law Firm today. All consultations are free. Visit AirCrashSettlements.com or call 800-794-0444.

"In my 20 years of working on aviation cases, I've never seen such egregious and greedy conduct on behalf of a company," Nomi Husain, founder of Husain Law and Associates, said Monday during a news conference in downtown Houston.

Monday's lawsuit was filed on behalf of Hassan Abdi, the brother of 29-year-old Mucaad Hussein Abdalla of St. Cloud, Minn., by Husain, Houston attorney Omar Khawaja and the Illinois-based Wisner Law Firm. Abdalla was killed in the Ethiopian Airlines flight, less than two months after getting married.

Lawyers in Chicago and San Francisco have filed the suit on behalf of a Brampton, Ont., family who lost six members and a Hamilton-based man who lost his wife and three young children.

Here is a table of 20 more lawsuits filed against Boeing in May 2019

Date	Name	Judge	Case number
05/21/2019	Rini Eka A. Soegiyono vs The Boeing Company	Judge Sharon Coleman	19-cv-3415
05/20/2019	Nadege Dubois Seex et al vs The Boeing Company	Judge Edmond Chang	19-cv-3392
05/20/2019	SPS TECHNOLOGIES vs The Boeing Company	Judge Manish Shah	19-cv-3365
05/20/2019	Pawel Konarski vs The Boeing Company	Judge Matthew Kennelly	19-cv-3381
05/16/2019	Claudio Chimenti vs Boeing Co., The	Judge Ruben Castillo	19-cv-3298
05/16/2019	Melissa Mairesse vs Boeing	Judge Sharon	19-cv-3297

	Company, The	Coleman	
05/15/2019	George Victor K'Obien vs The Boeing Company	Judge Charles Norgle	19-cv-3285
05/02/2019	Andrea Spini vs Boeing Co., The	Judge Edmond Chang	19-cv-2969
05/02/2019	Andrea Spini vs Boeing Co., The	Judge Matthew Kennelly	19-cv-2971
05/02/2019	Septiana Damayanti vs The Boeing Company	Judge Manish Shah	19-cv-2979
05/02/2019	Bias Ramadhan A.S. Bin Mi vs The Boeing Company	Judge John Tharp Jr.	19-cv-2980
05/02/2019	Anice Kasim vs The Boeing Company	Judge Robert Gettleman	19-cv-2982
05/02/2019	Rukein Binti Sudadi, et a vs The Boeing Company	Judge John Blakey	19-cv-2984
05/02/2019	Bian Daniaty Binti Udin Z vs The Boeing Company et al	Judge Ruben Castillo	19-cv-2987
05/01/2019	Anna R. Simarmata et al vs The Boeing Company	Judge Harry Leinenweber	19-cv-2919
04/29/2019	Manant Vaidya vs The Boeing Company	Judge Joan Lefkow	19-cv-2848
04/29/2019	Manant Vaidya vs The Boeing Company	Judge Elaine Bucklo	19-cv-2849
04/24/2019	Agnes Tjandra et al vs The Boeing Company	Judge Sharon Coleman	19-cv-2774
04/24/2019	Paul Njuguna Njoroge vs The Boeing Company	Judge Manish Shah	19-cv-2844
04/24/2019	Paul Njuguna Njoroge vs The Boeing Company	Judge Sharon Coleman	19-cv-2846
04/24/2019	Frederick Karanja Mungai vs Boeing Corporation, The	Judge Rebecca Pallmeyer	19-cv-2770
04/24/2019	Agnes Tjandra et al vs The Boeing Company	Judge Sharon Coleman	19-cv-2774

These lawsuits are obviously only the beginning. It is likely that there will eventually be hundreds of lawsuits against Boeing. Hopefully, one of more of these attorneys will read this report and ask Boeing the 25 questions that Boeing has not yet been willing to answer.

10 The Case for Public Ownership of Boeing

Decisions at Boeing are currently made by a small group of very rich corporate executives. Each year Boeing makes billions in profits. Boeing is making huge profits off subsidies from our tax dollars. Both the State and federal government give Boeing BILLIONS in tax breaks every year. Without these tax breaks Boeing would not make any profit at all. If we fund Boeing, we should control it, too. By taking the aerospace juggernaut into public ownership Boeing's profits and technology could be used for the benefit of all, rather than boosting the profits of the rich.

After the state legislature offered \$3.2 billion in tax breaks for Boeing, even a mainstream columnist from the liberal Seattle Weekly demanded that Boeing be taken into public hands: "We could push to nationalize them. Boeing lives off the public dole anyway. We could either be done with their blackmail - which will only get worse - or take the controls of this flying porker ourselves." (See Knute Berger, "Mossback: Boeing 7\$7- The cost of keeping the company happy keeps going up": Seattle Weekly, 6/4/03, www.Seattleweekly.com/features/printme.php3?eid=44618)

Public ownership is the only policy that has proven successful in controlling the activities of major corporations and industries.

At the end of the 19th century in the United States, we saw many utilities - such as electricity, gas, public transportation, and education - taken out of the hands of profiteers and put into public ownership. We can do it again. Under public ownership Boeing could be re-tooled. Production could be directed away from military contracts and instead toward providing useful products and services for public need. This would create a huge number of new jobs. The work week should be reduced to 30 hours with no loss in pay or benefits, in order to create new jobs at a time of very high unemployment in Washington State. This could easily be paid for by the tax breaks our State and federal governments are giving away to Boeing's corporate executives. Corporate policies to maximize short-term profits now mean cutting wages, shifting taxes from big corporations and their owners to workers, privatization of publicly-owned services, building up the US. military to defend its overseas operations, and cutting "unnecessary" social benefits like education and health care, etc.

These policies represent a massive attack on all working families. Most Americans are already feeling the effects and a growing uncertainty. We should end the bailouts and handouts to Boeing and to instead demand public ownership of Boeing. This demand is the only way to prevent further job losses and further losses to our community. By raising this demand, we will provide hope to hundreds of thousands of workers who are desperate to find work or who fear joining the ranks of the unemployed.

Boeing currently owes Washington state at least \$45 billion in back taxes.

If we looked merely at Boeing income in 2018, their revenue was over \$100 billion with about \$10 billion in net profits. But Boeing also dodged the Washington state 5% sales tax (\$5 billion on \$100 billion in sales) and the 1% Washington State Business Tax (\$1 billion on \$100 billion in sales) and the Washington State 1% commercial property tax on \$250 billion in stock worth (\$2.5 billion) for a total illegal state tax evasion of at least \$8.5 billion just for 2018. In addition, Boeing evaded at least \$2 billion in federal taxes and other federal corrupt corporate give aways. In short, Boeing's entire \$10 billion profit margin in 2018 came from state and federal tax evasion.

The consequences for the one million school children in Washington state has been devastating. Not only are students in Washington state forced to endure the highest class sizes in the nation, they have also been forced into spending their school days in the most unsafe run down schools in the nation. In 1997, when the Boeing tax scams really took off, Washington schools had a \$20 billion school construction crisis. One in four schools was more than 40 years old. Today, after 20 years of Boeing tax evasion, Washington schools face a \$40 billion school construction crisis – rising at a rate of more than one billion per year. One half of all Washington schools are more than 40 years old. One half of Washington schools do not meet either water quality standards or earthquake standards. 550,000 children are forced to attend school in either unsafe schools or particle board boxes. If Boeing were forced to pay back the \$45 billion they owe Washington children, we could launch the biggest school construction project in the history of the world, employing more than 100,000 people to build students the safe public schools they need and deserve. But Boeing does not care about the children or schools in Washington state, they are more likely to declare bankruptcy than to pay their fair share of state taxes.

We should offer Boeing a deal once they file for bankruptcy and no longer need their factories:

We will waive your back taxes in trade for your factories in Renton, Seattle and Everett. Then the people of Washington state can hire back all of the Boeing employees and build safe airplanes based on the Airbus A320 Neo design. We can finance the entire project by starting a Public Bank here in Washington state.

<https://www.washingtonpublicbankcoalition.org/>



Our slogan can be **“Putting public safety ahead of corporate profits.”**

We can then employ thousands of former Boeing employees to build safer airplanes - and we can use the profit from the sale of safer airplanes to build safer and healthy schools here in Washington state.

There can be a silver lining to the Boeing murder of hundreds of people. But it will require people everywhere to wake up to the corporate crime wave that has been going on at Boeing for more than 20 years.

As always, I look forward to your questions and comments.

Regards,

David Spring M. Ed.

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