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Inflators 101: What is an inflator and what is the problem?
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I'm here to give you a little Inflator 101—that is, what are these things we are so interested in and what is the problem with them? Prior to joining the agency, I spent a few years designing and testing air bags for new vehicles, so I've seen a lot of inflators and a lot of tests to show how they work.

Inside every air bag is a device called an inflator. And the inflator's job is exactly what it sounds like: to make the air bag inflate when triggered. Let's look at how that happens.

This slide shows the inside of a typical driver inflator and a typical passenger inflator. It looks complicated and it is! It's really advanced science! But we can make it easy to understand the basics. When there's a crash, sensors in the vehicle send signals to a control unit for the air bag. Basically, the control unit is a tiny computer. And in just a fraction of a second, the control unit decides if the crash is big enough to need an air bag to protect the people in the vehicle. If it is big enough, the control unit sends the signal to the inflator. This part here and here, called the "igniter" receives the signal, which ignites a small charge, like a spark, which then ignites the main fuel. In air bag inflators this fuel is called "propellant" and we'll be talking a lot more about propellant today. Propellant can be pressed into many different shapes and sizes, but in recalled Takata driver inflators, the propellant is shaped into "batwings" and in Takata's passenger inflators the propellant is shaped into wafers of various thicknesses. So getting back to how this works… Once the propellant is ignited, there is a chemical reaction that releases a lot of hot gases almost immediately. It happens so fast it takes just a few more fractions of a second – we're talking 25 to 50 1,000ths of a second. And it sends the gases out these holes in the inflator into the air bag, which is folded up inside the air bag unit. In a crash, those gases inflate the air bag before the person in front of it ever gets close to the dashboard or steering wheel, or anything else in the car. A frontal air bag protects the head and chest, giving extra protection on

top of that already provided by the seat belt. Everything I just described happens in less than the blink of an eye, or about 1/10th of a second.

NHTSA estimates that frontal air bags have saved nearly 43,000 lives since they became a required safety feature, and they continue to save many lives each year. Air bags have evolved far beyond just frontal bags, and now include seat mounted side bags, side curtain bags, knee bags, center console bags, and rear seat inflatable seat belts. These newer air bags have been specifically designed to meet increasingly tougher standards for side impact and rollover crash protection. Many other designs are also in development. At the agency, my team of engineers and researchers create test procedures that may require manufacturers and suppliers to develop air bags and car structures that provide more and more protection to people inside the vehicle.

But, some air bags have had problems. The reason we are here today is because certain inflators made by Takata and installed in Takata air bag modules—that's just a term to describe the whole air bag unit—do not function properly in a frontal crash. And the results are devastating. This video shows, in very slow motion, a test that NHTSA ran of a typical Takata passenger air bag inflator being deployed in a sealed chamber. This is a normal deployment. You might see some small flashes and then a rush of gas, that's what you see with some gases coming out of the inflator holes. However, in this next very slow motion video, which also shows a test NHTSA ran, something goes horribly wrong. And this is in very slow motion. A catastrophic failure inside the inflator shatters the steel tubing of the inflator and sends metal fragments and shrapnel all over the test chamber. This is what we are talking about when we say rupture. By the way, this is also extremely loud. We don't have sound on this video, but it is an explosion, so when it happens only 1 or 2 feet in front of you in a crash it must be unbelievably loud. And in a real vehicle in a crash, these metal shards and shrapnel you see coming out here, can cut through the air bag and shoot out towards a person in the vehicle. This has happened many times now and people have been injured and even killed when these Takata inflators malfunction in this way.

As will be explained in more detail in this meeting, we believe that the reason these inflators are malfunctioning in this way has something to do with the type of propellant Takata is using and how Takata engineers it. That's the fuel I explained before, right here. That fuel is called phase-stabilized ammonium nitrate, or "PSAN" for short. That's P. S. A. N. PSAN. And

many, many scientists and engineers are trying to figure out what exactly is going wrong. We don't know yet, but the best and most current information is pointing to some problem with the way this Takata PSAN propellant changes as it gets older and how it burns differently, possibly because of those changes. Again, we'll talk more about that later.

These inflators and others from Takata with similar technology have been installed in millions of vehicles over the last 15 years. What you are about to hear in the coming presentations is what the agency has been doing through its Coordinated Remedy Program Proceeding, the facts the agency now knows, and some analysis based on that information. We'll also try to address questions that vehicle owners may have based on all of this information.

That concludes the overview of how an inflator works and what the defect is that we're discussing today.