Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

Opening Remarks for the Public Release of the Transportation Safety Board Report into **Cougar Helicopters Flight 91**

Delivered by:

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WENDY TADROS:

Thank you for joining us this afternoon.

On the 12th of March, 2009, 18 people boarded a Sikorsky S-92 helicopter bound for the oil rigs of the North Atlantic. It started as a normal day. But about 40 minutes later—just 35 nautical miles from St. John's—something went tragically wrong, and the helicopter plummeted into the unforgiving waters of the Atlantic.

Shock and grief struck the families of the victims in the days and months that followed, and all Newfoundlanders shared their pain. For many, the memories are still raw.

It is the nature of tragedies that those who are left behind search for answers. The Transportation Safety Board of Canada is responsible for finding those answers—and recommending ways to improve safety.

The investigation into Cougar Flight 91 was one of the most complex the Board has ever undertaken. It began with the deployment of a team of specialists, who quickly recovered and examined the wreckage. It involved many, many experts, dozens of engineering tests, and thousands of hours of research and analysis.

What this work revealed was a complex equation involving 16 causes and contributing factors. We will tell you what we learned of all those factors and why no one stands out above the others.

We knew some things early on, too. Just over a week into the investigation, the TSB reported on the failure of damaged titanium studs on the main gearbox oil filter bowl. We know that when those studs broke it led to a massive loss of oil, and a series of events that ultimately brought down the helicopter. And as soon as we knew it, we alerted the regulators and the helicopter manufacturer—and the studs have now been replaced on all Sikorsky S 92 helicopters worldwide.

But this tragedy was about more than failed titanium studs, and had our investigation stopped there, that would have been too simplistic. So in the months that followed, we dug deeper, and we found many underlying problems. This led to four aviation safety advisories: one on helicopter pilot helmets, one on survival suits, another on the automatic oil-bypass system, and a fourth dealing with helicopter emergency floatation systems.

Today's report is the culmination of two years of work. We have identified 16 factors that contributed to this accident. Take any one of them out of the equation, and we likely would not be here today.

Mr. Cunningham will explain the final moments of Flight 91, and how we came to our conclusions.

What I can tell you is that today we have an opportunity, an opportunity to make helicopter travel even safer.

To that end, the Transportation Safety Board of Canada is making four recommendations—so that passengers will be as safe as possible, from takeoff to touchdown.

Before I tell you about those recommendations, however, I will ask Mr. Cunningham to walk you through the history of the flight.

MIKE CUNNINGHAM:

On March 12, Flight 91 departed St John's and climbed to their cruising altitude of 9000 feet. On this map, you have the outbound track in green, the inbound track in red, the impact point is marked by a star and the dashed line represents the crew's selected course back to St John's.

At 9:45 local, twenty-eight minutes after takeoff, the crew of Flight 91 suddenly became aware they had trouble when a red warning message appeared in the cockpit, indicating low oil pressure in the main gearbox. What the crew didn't know was that two of the three main gearbox filter bowl mounting studs had broken. When they broke, the oil in the main gearbox escaped rapidly. Without enough oil, the gears began to overheat, and this led eventually to the failure of the gear driving the tail rotor. Shortly after it failed, Flight 91 crashed into the Atlantic—just 11 minutes after the first indication of trouble.

I will now show you an animation and provide you with an idea about the challenges facing the crew of Flight 91 that day.

[Animation plays onscreen]

Here we have the aircraft en route at 9000 ft.

Then the crew got a main gearbox warning indicating they had a loss of oil pressure and the animation shows a close up of this. The first warning was followed approximately 25 seconds later by a secondary indication of trouble, when the oil pressure dropped below 5 psi.

The crew turned around and began to descend. As they descended, the crew transmitted a Mayday and began working through the emergency procedure.

We are now going to jump ahead to the helicopter established in level flight at 800ft with the crew heading back towards St. John's.

Suddenly, something dramatic happened that triggered the crew to decide to ditch and the Flight Data Recorder to shutdown. We were able to collect additional data from other onboard systems which allowed us to further our understanding of the event.

The crew advised ATC that they were ditching and gave the ditching command to the passengers.

The aircraft was under control at first. However, the tail rotor failed when the gears controlling it began to break down.

You can see the tail rotor pinion and the stripped gears on the left.

Tail rotor failure is one of the most difficult emergencies to control, and this was the first documented case of one in an S-92.

The crew had no option but to shut the engines down and begin an emergency power-off landing.

The crew did their best faced with an extremely challenging situation.

Data collection stopped at 90 ft with a 2300ft/min rate of descent. From this height, the helicopter fell to a severe impact with the surface.

The impact disabled the Emergency Flotation System, and the helicopter sank quickly.

Due to the crashworthy features of the S-92, all 18 people survived the initial impact with the water. However, only 2 of the helicopter occupants escaped the wreckage, and only 1 survived.

[Animation ends]

You will note as you read our report and findings that many of the factors we identified were beyond the control of this crew. Let me tell you about some of those factors.

The written procedure began with a non-critical gradual loss of oil, eventually concluding with a critical total loss of oil. This delayed the crew's response to this emergency.

In addition, the loss of oil procedure emphasized that the crew should expect to see an increase in oil temperature. Instead, the crew saw a normal temperature indication.

The crew did not realize that a total loss of oil would result in a normal oil temperature indication because this information was not included in their manuals and was not covered during their training.

The crew's lack of understanding of the main gearbox oil system contributed to their belief that the low oil pressure indication was related to a sensor or a pump problem rather than a total loss of oil.

The crew training in the flight simulator always began with a gradual loss of main gearbox oil pressure and progressed to include vibrations which led the pilots to an emergency landing or ditching.

The crew of Flight 91 was seeing something for the first time. They had never been presented with a scenario in the simulator where the oil was lost so suddenly.

Based on their understanding of the situation, and the belief that there was still oil in the main gearbox, the crew decided that continuing flight toward St. John's was less risky than ditching. When the tail rotor began to fail, the crew was unable to safely land the helicopter on the water.

WENDY TADROS:

Now you have heard about the history of the flight and understand something of the 16 factors that were at play.

Since the crash, the operator, the manufacturer and the regulators have all taken action. And while the causes of this specific accident have largely been addressed, when we looked at the bigger picture, we found risks still exist.

One of these involved the certification standards—specifically, how long helicopters should be able to operate following a massive loss of main gearbox oil. The chances of this happening were once considered “extremely remote.” Tragically, this was not the case.

I will now ask Mr. Clitsome to put the risks in perspective for you.

MARK CLITSOME:

This wasn’t the first time that broken titanium mounting studs have been identified as a potential problem on the S-92 main gearbox.

Eight months before Flight 91 crashed, an S-92 helicopter in Australia experienced the same massive loss of oil in the main gearbox with similar indications as Flight 91. They too were flying over water but, fortunately, they were able to make landfall without further incident seven minutes later. The captain indicated afterward that, if a landing area had not been available, and had there been no other secondary indications of trouble, he too would have continued flight toward land.

Post-occurrence inspection showed that two of the three titanium studs on the oil filter bowl had fractured, leading to a total loss of oil. About two months later, independent laboratory analysis concluded that the studs fractured due to metal fatigue. One possibility for this was galling.

Galling happens when the nuts wear down the threads, as they are removed and reinstalled to change the oil filter. Titanium, for all its advantages—lightness and strength—is relatively poor at withstanding wear and tear from this type of contact.

The reason for the excessive galling was that the main gearbox required more frequent oil filter changes than originally designed. And no one had identified this as a potential hazard.

In the fall of 2008, after the Australia occurrence, Sikorsky, in consultation with the US Federal Aviation Administration (FAA), notified all operators worldwide of new mandatory inspection procedures, aimed at finding and removing damaged studs. In January 2009—two months before Flight 91 crashed—Sikorsky issued a bulletin requiring all titanium studs be replaced with steel ones, within 1250 flying hours or one calendar year.

At the time of occurrence, Cougar Helicopters had already ordered the new steel studs. They had not, however, effectively performed enhanced inspection and maintenance procedures. This risk, therefore, remained unaddressed until the day of the accident.

During the course of our investigation, we also looked at certification. Although this wasn't one of the causes of this accident, I'll tell you how the S-92 came to be certified without a 30 minute "run dry" and why there is still a risk that exists today.

Multi-engine helicopters like the S-92 go through a long and rigorous design and certification process. This includes many tests to ensure that parts do not fail—or, if they do, the effect is predictable or minimized. Of the many requirements for the main gearbox, one was for it to be able to run dry—that is, run without oil—for 30 minutes after the failure of the normal lubricating system. This timeframe was picked to enhance landing opportunities following a massive oil loss.

Originally, this timeframe was a requirement for military helicopters, but in developing its rule, the FAA believed that civilian aircraft could also meet this. However, when it came time to perform the run-dry test, there was a catastrophic failure after just 11 minutes. Following the failed test, Sikorsky and the FAA reviewed the rules and decided that a total loss of oil lubricant would only happen if the oil cooler system failed. Any other source of total oil loss was seen as, and I quote, "extremely remote."

For this reason, they chose to redesign the main gearbox's lubrication system to include a bypass valve for the oil cooler instead of taking steps to redesign the gearbox. What they did not consider was a failure in the main gearbox oil filter bowl—or its titanium studs. This is exactly what happened to Flight 91.

It's important to note that if the rules state that you don't have to pass a test, then you don't have to pass a test. The problem is with the rule. And this hasn't changed. Yes, the titanium studs have now been replaced with steel ones, thereby addressing the causes of this specific crash. But, the gearbox has not changed. In the event of a sudden loss of oil, there would still be only 11 minutes before the gearbox fails.

The S-92 is the only helicopter to be certified using the "extremely remote" provision. In fact, since that rule came into effect, the European regulator certified four helicopters as capable of meeting the 30-minute "run dry." The FAA and Transport Canada also certified one each. So, we know it's possible for civilian aircraft to meet this requirement.

WENDY TADROS:

Nothing in an emergency is more precious than time—time for crews to understand and react. And that is the driving force behind our first two recommendations: First, the 30-minute requirement is negated by the "extremely remote" provision. Therefore, it needs to go. It's as simple as that: We recommend that all Category A helicopters, including the S-92, should be able to fly for at least 30 minutes following a massive loss of main gearbox oil. Moreover, with advances in technology, we want the FAA to look at today's operating environments—Hibernia, the Arctic, the North Sea … any of these extreme locations—and decide whether even 30 minutes is enough time.

Third, if a helicopter has to ditch in rough waters, its Emergency Flotation System should keep it afloat long enough for everyone to evacuate safely. If it can't do that—if a helicopter isn't up to the task—it shouldn't be operating. Period.

Our last recommendation deals with preventing drowning. All 17 victims of Flight 91 died by drowning. It is the number one cause of death in ditching or crashing accidents. We have learned that cold water does more than cause hypothermia. Cold water makes it almost impossible to hold your breath. That is why passengers and crew on flights off the shore of Newfoundland are now being provided with an Emergency Underwater Breathing Apparatus. But to make sure passengers in the rest of Canada have the same chance for survival, the Board is calling for emergency breathing equipment on all flights where survival suits are worn.

Today, we have told you about all of the factors that brought down this helicopter. Mr. Clitsome spoke to you about the frequent oil filter changes, and how repeated removal led to galling which eventually weakened the titanium studs. He told you how the problem was picked up after Australia but that, although inspections were supposed to be stepped up, the studs were not immediately replaced. Mr. Cunningham spoke about the crew and the decisions they made in response to the emergency. He talked of their training and the procedures they had, and of the profile they flew. All told, there was a complex web of 16 factors at play that day. None of these stands out above the others. In fact, take any one of them out of the equation, and we likely would not be here today.

Let me conclude with some final thoughts.

Historically, much of Newfoundland's wealth has come from the sea. So, too, have many of its tragedies. At the Transportation Safety Board, we work to learn from these accidents in the hopes that the more we learn, the less likely it is, they will be repeated. Even so, we are painfully aware that, long after science has explained what caused an accident, the human cost remains. In the immediate aftermath of Flight 91, some men and women chose not to return to the rigs. For them, the risk was too great. But for others—for those who rely on helicopters to get to work—we have to do all we can to ensure their safety.

That's why we have dedicated so much time and effort to this investigation—to make sure that the legacy of this accident is an improved system for all those who must fly over water.

Thank you for your time. We are now prepared to take your questions.