**What will be in the rearview mirror of next-generation investigators?**

**Wendy Tadros, Chair of the Board, Transportation Safety Board of Canada  
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Good morning.

Thank you for that kind introduction.

Thanks also to Barb Dunn for inviting me to speak to you today. It’s always a privilege to come to ISASI.

To those of you joining us from all over the world, I’d like to extend a hearty welcome to Canada and Vancouver.

An exciting week has been planned and I look forward to hearing how you are going to prepare the next generation of investigators.

This theme couldn’t have come at a more important time for us at the TSB and for the air safety community as a whole.

Today, I want to challenge you to peer into your future.

But first I want start by looking in the rearview mirror.

In my time at the Board, the business (or nuts and bolts) of investigations has changed.

Now more than ever we are leveraging technology, going beyond determining just what happened to really trying to understand why.

We are highlighting trends, and communicating what we found so things will be made safer.

I want to talk about the evolution of the investigator—from old school to newer school. And about where you might go next.

Along the way, I want to touch on some advances in technology, the importance of human factors, improvements in liaising with families, and communications, and how these innovations have been driven by investigators like you.

At the forefront of changes in the last two decades is the introduction of leading-edge technology.

You now have infra-red spectrometers to identify non-metallic trace materials—like oil on a windshield, or hydraulic fluid on a runway. You use ultrasonics to detect flaws in welds or castings. Then there are the X-ray CT scanners—modified versions of what hospitals use to detect brain tumors or heart abnormalities.

Only now they are industrial versions, designed to look through thicker materials, so you no longer have to destroy any evidence to see inside.

And if we don’t have it at the TSB, we borrow it from partners like the NTSB—as we did this summer with their laser scanners that can generate 3D models of anything from an aircraft cockpit to a ruptured railway tank car.

There have been advances in flight recorder technology too, to the extent that the TSB has recommended that smaller aircraft to be fitted with lightweight flight recorders.

In parallel, there have been advances in retrieval of non-volatile memory—a part of so many of today’s devices, which often survive impact and contain downloadable data.

To all of this we can add photogrammetry.

We can create contour maps, 3D models, or figure out which of two helicopters involved in a mid-air collision was at the wrong altitude. With enough photographs to work with—or, as in one case, actual video filmed by a passenger—we can even determine approximate flight paths.

These new tools add a level of sophistication, a level of detail that simply wasn’t available to us before.

And this has meant we need experts who understand the technology and its capabilities and who will use it to maximum effect to get to the bottom of what happened in accidents.

All so we can more definitively pinpoint what went wrong—and what needs to be fixed.

But while technology is the most tangible change we have seen in the last two decades, it is not the only change.

There are now many intangible factors investigators look at.

We have moved from just carefully examining the machine and how it failed. Today we often spend just as much time looking at the organizations and the people who run those machines. That takes a different skill set.

As I said earlier, the role of the investigator is evolving—from old-school to newer-school. We are learning more about why people make the decisions they do, especially when they’re under pressure: time pressure, economic pressure, or just the basic pressure to get the job done.

In this broader view, investigators now consider accidents in the context of an organization’s overall policies and priorities. Because we know that accidents are never the result of just a single individual or factor. We know they are almost always organizational. And that is a big evolution.

As part of this newer world view, we don’t talk about pilot error any more. People make mistakes. However, what we’ve learned about human factors is that sometimes, to the people flying through the middle of the storm, those decisions seem perfectly reasonable—or at least perfectly understandable, at the time anyway.

And more and more, today’s investigators are delving into the whys behind that decision making. You are looking in depth at issues such as fatigue and more and more at cockpit resource management.

As it becomes clearer how fatigue affects people’s decisions, we are focusing on fatigue in more of our investigations. To do this, we’ve had to increase our own understanding of the science of fatigue. We’ve had to hire experts and better train our investigators in the field.

Our understanding of cockpit resource management, or CRM, has also developed in recent decades. Today’s investigators need to know how people interact with one another in the cockpit, and how crews make their decisions. They need to figure out if these interactions played a role in the accident.

To do this, our investigators have had to re-think some of the old approaches.

In Canada this really came to the forefront with the 2009 Sikorsky S-92 crash off the coast of Newfoundland. And it is something we are intensively looking at in our ongoing investigation of the 737 crash near Resolute Bay in Canada’s Arctic.

We are far from alone in this. CRM is something that is being examined in many international investigations, most notably by the BEA (Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile) in the investigation into Air France 447.

Another key area that has evolved is the way in which investigators and our organizations liaise with those whose lives have been affected by transportation accidents.

I’m talking about the families, the loved ones, and the survivors.

In 1996, when TWA Flight 800 exploded off the east coast of the United States, it forced Americans to design new ways of delivering family assistance.

In Canada, it’s a lesson we’re still learning. It started with the 1998 crash of Swissair Flight 111. Before that, we hadn’t devoted a lot of time to the people who were grieving. With Swissair, that changed.

Investigators began giving briefings and showing families the wreckage so they could see we were working as hard as we could—working to get answers for them. This emphasis was new for our investigators—and it too required a whole new skill set.

Speaking of new skill sets, the final change I want to talk about is how we communicate. Most things are electronic now and we get it out there on our website, through webcasts, and Twitter and Flickr. And we blog about the lessons learned.

At the TSB, we use these new social media tools to reach a broader audience, really for two reasons. First we think it is better if more Canadians support the work we do. But before they can support it, they have to understand it, and these new tools help us explain what we do.

The second reason is that we hope the right people will take note and take the right action to reduce the safety risks we have worked so hard to uncover.

And once the accident report is out, we no longer automatically move on to the next one. We talk to industry, regulators and the public, and we come back to the safety themes if we see them again, and we talk about them all over again.

Again, it’s old school versus new school.

In my time at the TSB, I’ve seen phenomenal change. But here’s the thing about change: back in the early days, none of those things I just talked about were standard elements of any investigation.

And when each one came along, it wasn’t as if there was instant, universal acclaim for its adoption. Every single one of these new ideas started off as an experiment.

Investigators had to be willing to go against the current and say, “Look, we need to do this because it matters, because it will make a difference: we need to have our own lab with the best tools. We need to look in depth at human and organizational factors. And we need to keep the families and the public apprised of our investigations.”

Investigators faced resistance. But it’s the investigators like you who held their ground—who helped to make the case for change.

Because of the work you have done, we know accident rates are coming down.

But to make sure we continue to see progress in key areas, more change is needed in all of our countries. And the way I see it, you investigators need to be the catalyst for that change.

I like to say the reason we hired you is because you are people who question. And hopefully you don’t use the status quo as a crutch.

Because, a few decades from now somebody else will be standing at a podium just like this reporting on the developments in their timeframe—in *their* rearview mirror.

And you will want to be in it.

What part are you going to play over the next 20 years? What do you see when you peer into the future? What are you going to help change in the span of your career? What innovations of yours will they be talking about tomorrow?

Will you be going beyond the standard 72-hour sleep/rest check to look at quality of sleep, time of day, and whether circadian rhythms were involved? Will you be pushing to find out about acute fatigue, and chronic sleep debt? Will you make it the “new normal” to understand how the organizations we investigate are managing fatigue?

Investigators play a big role in how we communicate because you are often the trusted public face of an organization. You are on the ground at the accident site and there along the way as the public is updated. And when it comes time to make the findings public, you are there too, telling the story and calling for change.

How will this role evolve? Will you help get those safety messages out on the street just a little quicker so they can prevent the next accident?

Or will you find new ways to communicate to make the safety message that much stronger?

Will you push means of sharpening your own skills and encourage your organization to expand their expertise by hiring the brightest of the brightest?

Maybe—just maybe—you will find new ways to move beyond one investigation at a time or even beyond the work of one AIB to global trends driven by global data. Who knows?

Or in the vein of “think big or go home”, will you take an idea and turn it around 180 degrees for a whole new perspective on how we investigate?

Whether incremental or game-changing, I don’t know what these changes will be. That is for you to say. That is your history to write.

Thank you.