Remarks by Dr. Shyam Sunder, Lead Investigator
Building and Fire Safety Investigation of WTC Disaster
News Media Briefing
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[Remarks as prepared]

Thank you, Dr. Bement. Good morning to you all. I'd like to share with you specific details on the scope of the investigation, some of the advanced tools we expect to use, the steel we have recovered from the site, the broader data collection process, our plans to deal with human subjects, and the team we have assembled to carry out the investigation.

The NIST building and fire safety investigation will focus exclusively on three buildings: the WTC Towers—or WTC 1 and 2, and WTC 7—the 47-story building that collapsed later in the day on September 11, 2001.
We will strive to study the disaster holistically, paying particular attention to the interplay between the buildings, the occupants, and the emergency responders.

The lessons to be derived from our investigation, that were enumerated earlier by Dr. Bement, will benefit a broad range of new and existing buildings, not just the three specific buildings that are studied.

As part of the investigation, we plan to conduct eight specific projects that will address the overall objectives.

- #1: Analyze the code provisions, procedures, and practices used in the design, construction, operation, and maintenance of the structural, fire protection, and emergency access and evacuation systems.

- #2: Analyze the margin of safety of each of the WTC Towers and its structural components under design, service, and abnormal aircraft loads and evaluate the effect of the aircraft impact damage on the structural, fire protection, and egress systems.

- #3: Determine the metallurgical and mechanical properties and quality of steel, weldments, and connections from the steel recovered from these buildings.

- #4: Document and evaluate the performance of the active fire-protection systems—including sprinklers, fire alarms, smoke management systems, standpipes and hoses, and communication system—and their role in fire control, emergency response, and fate of occupants and emergency responders.

- #5: Reconstruct the time-evolving temperature, thermal environment, and smoke movement—including the effect of the fireproofing system—for use in evaluating structural response and the behavior and fate of occupants and responders.

- #6: Analyze the structural fire response of the WTC towers—with and without aircraft damage, WTC 7, and open-web steel joist floor systems—with and without fireproofing, and determine the most probable collapse mechanisms of each of the buildings.

- #7: Determine the behavior and fate of occupants and responders—both those who survived and those who did not—by collecting and analyzing new information on occupant behavior, egress, and emergency communications, and evaluating the performance of the evacuation system on September 11, 2001.

- #8: Building on the work already done by the Fire Department of New York and McKinsey & Co., determine the fire service procedures and practices up until WTC 7 collapsed, including factors such as building design, aircraft impact damage, communications and fire protection system failures, ability to fight large fires in the upper floors of tall buildings, firefighter location and tracking, resources available for situation assessment and incident management, equipment performance, pre-planning, and training.

We intend to use advanced scientific methods and tools extensively in the investigation. As an example, consider the preliminary simulation of the fireball that was generated when the second aircraft crashed into the South Tower, WTC 2. This simulation used NIST's Fire Dynamics Simulator, or FDS. It will help us estimate the amount of jet fuel that was consumed in the fire balls. Other examples, included in the B-roll tape provided to you, show how FDS can be used to evaluate the source strength of the fire by modeling the smoke plume and to analyze the fire and smoke movement within the buildings.

In the investigation, we plan to develop far more accurate representations of the WTC buildings, their contents and thermal properties, and air supply within them to reconstruct the time-evolving temperature and smoke environment using this tool. The results of these reconstructions will be used to evaluate the structural response of the buildings in fire, and the behavior and fate of occupants and responders.

NIST now has in its possession in excess of 100 pieces of steel from the WTC site that were identified by the Structural Engineers Association of New York and other BPAT members, including NIST. These pieces, several of which you see around here, include perimeter columns, wide-flanged beams, and trusses.

We plan to determine the metallurgical and mechanical properties of the steel, weldments, and connections, and to document the observed failure mechanisms and damage. This work will be very useful in estimating the temperature conditions in the buildings before collapse, and in analyzing both the structural response of the buildings to fire and the damage induced by the aircraft impact on the structural, egress, and fire protection systems.

I would like to draw your attention to the three pieces of steel on my left. The large upstanding piece is a prefabricated column element that was directly impacted by the first aircraft that crashed into the North Tower, WTC 1. The identification markings are visible clearly. As the charts here indicate, this piece of steel is one of many, now at NIST, tentatively identified to be from the near vicinity of the impacted region of this tower. We expect to test this steel at extremely high rates of loading—typical of those that would be encountered in an aircraft impact—using advanced technology now under development at NIST.

The second piece is a damaged and twisted open-web steel truss. This is a rare truss specimen that survived the collapse and was located by engineers at the salvage yards. The WTC towers made extensive use of these types of trusses to support the floor system by spanning the 35- to 60-feet distance between the exterior and interior columns. There is great interest in understanding how these types of trusses perform in fires, the ability of spray-applied fireproofing to stay in place on these trusses under shock, vibration, or impact, and how they are connected to the columns.

The third piece is a highly deformed and wrinkled column from one of the upper floors that we hypothesize could have been subjected to intense heat. A metallurgical analysis, that carefully studies changes in the microstructure of the steel, will allow us to estimate the temperatures reached in this specimen.

More broadly, we intend to base all of our review, analysis, modeling, and testing work for the investigation on a solid foundation of technical evidence. This will require unfettered and timely access to

critical data such as building documents, video and photographic records, oral histories, and emergency response records in addition to the steel that has been recovered.

The Port Authority of New York and New Jersey and Silverstein Properties have offered to provide NIST with access to all such information in their possession or in the possession of their contractors and consultants. New York City authorities have also offered to fully cooperate with NIST in its investigation.

We'd like to put out a special call today for photographic and video images that could help us better document the initial damage and the subsequent fire growth and spread in the WTC Towers and WTC 7. We are especially interested in WTC 7 and views of the South and West faces of the towers. Those who are aware of or in actual possession of such materials are encouraged to contact us.

Our study of occupant behavior, evacuation, and emergency response will require a systematic collection of new data from survivors, families of victims, witnesses, and others with operational responsibility on September 11, 2001.

The NIST Director has directed us to carry out the investigation to the highest technical and professional standards, by treating all those who experienced this disaster first hand with kindness and sensitivity, and in accordance with all legal and administrative requirements.

We will use established procedures to carefully review all survey and interview questions, data collection methods, and safeguards for maintaining privacy and confidentiality before proceeding with these critical data collection efforts.

Finally, NIST has assembled a seasoned world-class team to carry out the investigation. This team has the needed technical expertise as well as experience from significant prior investigations. Over two dozen NIST experts will be involved over the course of the investigation. In addition, we expect to significantly augment our in-house staff with external world-class experts in our project teams and as contractors.

This concludes my prepared remarks. Thank you.