Accidental Disruption: An Overview

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This white paper is designed to provide analysis of relevant, publicly available information on threat and hazard events/trends and their potential impacts to the interests of the United States, both at home and abroad. This product is not intended to be an all-encompassing assessment of the subject.

Introduction

An accidental disruption is defined as the unintentional failure or loss of technology, systems, and utilities due to aging equipment and infrastructure, harsh environmental conditions coupled with inadequate maintenance, negligence, or other accidental events. As seen in this paper's case studies, the degradation and failure of several systems due to inadequate maintenance and negligence of certain systems are assessed as the main catalyst for large-scale accidental disruption events.

Background

Accidental disruptions encompass a wide range of incidents to include power outages, water and/or steam outages, failure of pumps or HVAC systems, communications outages, internet outages, and/or failure of networked systems. Such accidental disruptions can be caused by the failure of aging equipment and infrastructure. Additionally, accidental disruptions can also be caused by extreme weather events or other harsh environmental conditions, including the presence of wildlife and their interference/disruption with the daily operations of various systems and critical infrastructure. Human error and mismanagement can also lead to or exacerbate these situations due to poor maintenance, negligence, and inadequate training. Budget restrictions and other economic hurdles may impede proper repairs and maintenance that are required for degrading and failing equipment, resulting in an increase in the likelihood of accidental disruptions.

Accidental disruptions are unique as they can often be difficult to predict when compared to other types of hazards. For example, an organization may be prepared for weather events and wildlife interference. Systems and equipment that are not regularly maintained or are used beyond their service life are much more likely to fail, though the actual time of failure may not be easily determined. If such maintenance/service life issues are endemic, accidental disruptions may occur on a regular basis.

There are also "black swan" events that are far outside the expected range of probability. Such events may include incidents that are the direct or secondary result of rare meteorological or geological events, space weather, or other unforeseen circumstances. Accidental disruptions, recurring or not, may also have cascading effects, in which the failure of one system leads to the failure of one or more additional systems. For example, the failure of an electrical grid could affect other critical systems, including security, wastewater pumps, or network-dependent communications systems. When planning to prevent, respond, and recover from accidental disruptions, it is incumbent upon organizations to recognize such secondary incidents.

Case Study: Dillingham Airfield

Recent reports have discovered a broken waterline at the Dillingham Airfield in Honolulu, Hawaii. The airfield is owned by the U.S. Army and operated by the Hawaii Department of Transportation Airports Division (HDOTA). The waterline is leaking millions of gallons every month and has been doing so for nearly two decades. The lack of response demonstrates the effect that the degradation of systems and negligence to repair critical systems can have on accidental disruptions. The broken waterline is located beneath the Mauka hangar and is

part of the runway at Dillingham Airfield. Per open source reports, elected state leaders have stated that between 2-3 million gallons of water are lost each month. Additionally, the state has been unable to identify where the water that leaks from the system eventually leaks to, meaning that the full scope of the disruption's impact is not yet known. Broken pipes in the waterline were first identified in 2005 by HDOTA as state leaders have indicated that issues with the system have dated back nearly two decades. The agency agreed to take over the maintenance of the water system when it started leasing the land several decades ago.

The broken waterline serves the airport hangars and skydiving operations at Dillingham Airfield, along with several nearby homes, Camp Erdman, the Satellite Tracking Station, and Mokuleia Beach Park. The current repair plan is not the first attempt to fix the system. Outside of the pump house, there are 1,700 feet of pipe the State of Hawaii paid for with state funds several years ago that has yet to be installed. HDOTA has stated that repairs are expected to take approximately two years after the design of the bypass is vetted by federal, state environmental, and archeological reviews before approval by the U.S. Army. The exact cost of the project remains unclear.[1,2]

The broken waterline at Dillingham Airfield is further complicated by an aging storage tank that holds 100,000 gallons of water, with no current plans to refurbish the storage tank. Currently, the DOT is permitting the transmission of 55,000 gallons of water a day, equating to approximately 1.6 million gallons per month. However, such permissions have been exceeded regularly for 17 years, likely increasing the likelihood of an equipment failure as the system is already degraded and repairs have been neglected. As of 2024, the DOT can relinquish its responsibility over the water system, and no other agency has plans to assume control.

Case Study: Brooklyn Subway Security Cameras

On 11 April 2022, a faulty fan caused a glitch that prevented security cameras at a Brooklyn, NY subway station from transmitting up until technicians were able to correct the issue on the morning of 13 April 2022. In the days prior to this accidental disruption event, technicians were working to replace a fan unit at the subway station that initially wasn't impacting the transmission of the cameras' feed (per open source reporting). The technicians were able to replace the fan unit on 8 April, but network diagnostics still indicated a problem which prompted Metropolitan Transportation Authority (MTA) technicians to make a series of repairs in an attempt to correct the issue. While doing so, on the morning of 11 April, as technicians were installing new communication hardware, several cameras failed. Reports characterize the cause of the outage as a "failure of hardware and software" which prevented the station's cameras from transmitting their feed. This unintentional equipment failure (faulty fan) resulted in cascading effects in which a Brooklyn subway station on 36th Street experienced camera outages that impacted other subway stations on 25th and 45th Street.[3,4]

On 12 April 2022 (as this faulty fan caused the MTA's security cameras at multiple Brooklyn subway stations to malfunction), an active shooter was able to fire 33 shots into a subway car pulling onto a platform and wounded 29 people which further led to a manhunt in the city. This active shooter event took place at the 36th Street Station in Sunset Park, one of the subway stations in which camera feeds were malfunctioning at the time. Reports indicate that there are 600 cameras on the North line in Brooklyn and that 36 separate camera feeds were given to police to help track down the suspect. Approximately 10,000 cameras dot every one of the City of Brooklyn's 472 subway stations. Despite officials indicating that the camera system's equipment failure did not delay the manhunt, it is important to note that system failure and other cases of accidental disruption have the potential to allow for active shooters, terrorists, and other threat actors to operate without being detected.[3,4,5]

Although a faulty fan was identified, replaced, and not initially impacting the transmission of the cameras' feed, the equipment failure resulted in cascading effects in which multiple camera systems at Brooklyn subway stations eventually malfunctioned. Reports have determined that this accidental disruption was not due to human error on the technicians' end whilst replacing the faulting fan and installing communication hardware. Instead, the internet connection failed while installing new communication hardware as a node that carried the internet connection for Brooklyn subway stations on 25th, 36th and 45th Street reportedly failed. This report indicated an unintentional failure of a communication system which in turn, resulted in the failure of several camera systems.[5]

Case Study: Old Havana Gas Leak

On 06 May 2022, Hotel Saratoga, a luxury hotel in Old Havana, Cuba, exploded while undergoing renovations. While there were no guests on the hotel property at the time of the explosion, 51 employees were inside. Of the 47 people killed in the explosion, 23 were hotel workers. Over 70 people were injured, 14 of whom were children. According to President Miguel Diaz-Canel, a gas leak originating from a tank truck that was servicing the building is suspected to be the cause of the explosion, and "everything indicated that the explosion was caused by an accident." Regardless of whether the explosion was the result of equipment failure or was human-caused, the incident highlights the potential for construction-related mishaps, which are categorized by RMC's Intelligence & Analysis Division as accidental disruptions. The explosion might also be categorized as Hazardous Materials (HAZMAT) incident.[6,7,8]

The damage to the hotel and the surrounding community was extensive. A representative of Grupo de Turismo Gaviota SA, the military-owned tourism company that operates the hotel, reported that 80% of the hotel was damaged in the blast. Hotel Saratoga was centrally located in the Old Havana municipality of Havana, Cuba, approximately 100 meters from Cuba's Capitol building. The Capitol was among 23 nearby buildings that were damaged by the explosion, though the Capitol's damage was limited to broken glass and damaged masonry. Fifteen apartments in a building adjacent to the hotel were completely destroyed, and one neighboring building will have to be demolished. The blast blew out the windows of the nearby Concepcion Arenal School, injuring five students, and badly damaged a church. According to one official, 38 homes were affected by the explosion and 95 people had to be relocated.[9,10,11]

Accidental disruption events like the explosion at Hotel Saratoga are difficult to predict and may be caused by a variety of factors. According to the Havana Manufactured Gas Enterprise, prior to the hotel explosion, an average of 30 possible home and external gas leaks were reported daily. It is important to note that gas leaks were reported in vicinity of the Hotel Saratoga prior to the explosion which may have contributed to the significance of the event. Although further details and a more thorough investigation of the events leading up to the gas leak and subsequent explosion are limited, this incident of accidental disruption could have been caused by multiple factors, including human error, equipment failure or degradation, or adverse environmental conditions, among other potential factors. While accidental disruption events are, by definition, accidental, other hazard factors such as hazardous material release may have an effect on the likelihood of occurrence and intensity of certain accidental disruption incidents. In the case of the Hotel Saratoga explosion, Cuba's aging infrastructure, potential construction mishap, and the strain that Havana's buildings, people, and infrastructure often face due to natural disasters may have had a part to play in setting the conditions for an accidental disruption event to occur. [12,13]

Outlook

Accidental disruption events will continue to occur as key systems, and critical infrastructure continue to unintentionally fail due to aging equipment and infrastructure, harsh environmental conditions, inadequate maintenance, negligence, construction mishaps, or other accidental events. In order to mitigate the potential for cascading accidental disruption effects, key systems, should be routinely maintained and not used beyond its expected service life. Adequate training for those operating various systems and equipment can also mitigate the occurrence of such events. However, systems will remain susceptible to human error, harsh environmental conditions, unpredictable equipment failure, and the interference of wildlife that are often difficult to predict. RMC's Intelligence & Analysis Division continues to monitor occurrences related to accidental disruption and continues to assess the potential for accidental disruptions for its clients' critical systems.

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