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The Rise of 3D-Printed Firearms

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SYNOPSIS

The recent assassination of the UnitedHealthcare CEO in New York has received widespread media attention over the last week. A notable characteristic of the assassination was the use of an unserialised firearm with 3D-printed components, which has become a growing security concern because of its ease of access and the anonymity it provides.

COMMENTARY

In the early hours of December 4, Brian Thompson, CEO of American medical insurance company UnitedHealthcare, was shot and killed in New York. The assassin was found to be 26-year-old Luigi Mangione from Baltimore, USA.

Mangione was born to an affluent family and graduated with undergraduate and graduate degrees in engineering from the University of Pennsylvania. He had written a manifesto decrying the healthcare system before the shooting. While his exact motivations remain unclear, sources speculate that his ordeal with persistent back pains may have played a role in shaping his actions.

One notable characteristic of the incident was Mangione's use of a 3D-printed firearm (3DPF). Popularly known as "ghost guns", these are privately manufactured firearms that do not have serial numbers and can either be bought as a kit or 3D-printed. They are difficult to track and detect because of the absence of serial numbers.

The number of 3DPFs is growing at an alarming rate, particularly in the US, and the assassination of Brian Thompson marks the first high-profile assassination involving a 3DPF.

The Firearm Used

The firearm used by Mangione was a Glock 19 variant known as the FMDA 19.2 Chairmanwon Remix. Mangione was also alleged to have used a 3D-printed suppressor along with the firearm. The firearm falls under a "parts-kit completion" (PKC) category. PKCs typically have a 3D-printed lower receiver (or frame) and are supplemented by commercially available, factory-made components such as the barrel, slide and trigger mechanism. In the US, the lower receivers are usually regulated, and hence, these are the parts that are often 3D-printed to circumvent gun laws.

There are two other categories of 3DPFs: hybrid firearms, which are mostly 3D-printed but utilise non-restricted metal parts, such as metal tubes, which are often repurposed into firearm parts, such as barrels, and fully 3D-printed firearms, which are entirely 3D-printed except for certain minor non-printed parts, like firing pins modified from nails.

The 43-page design manual for the FMDA 19.2 used by Mangione in the shooting provides step-by-step instructions on how to assemble the weapon, complemented with video links. The design manual is easily obtainable on the Internet and free to download. This firearm has a 3D-printed lower receiver and is supplemented with commercially available completion kits which "complete" the gun.

Most PKCs like this can be assembled in a mere 30 minutes once the lower receiver is printed. The entire firearm would cost about US$300-350 to put together. Commercial 3D printers cost about US$250-300 each. The ammunition used in the shooting appears to have been commercially sourced and typically costs about US$25 per round. Thus, 3DPFs are relatively cheap and affordable.

Manuals and information on a wide variety of 3DPFs are available on platforms such as Odysee, Reddit and open-source 3DPF websites. Complete step-by-step videos detailing the manufacture and assembly process of 3DPFs are aplenty on YouTube.

Global 3DPF Trends

Data collected by the author on global 3DPF incidents between 2013 and July 2024 highlights several key trends.

First, the frequency of 3DPF incidents has dramatically spiked since 2020, with cases in the first half of 2024 almost twice that in 2021. This can be attributed to technological advancements and an increase in case reporting. 3DPF incidents are primarily concentrated in North America and Europe, with the US and Canada recording the highest number. The US Bureau of Alcohol, Tobacco, Firearms and Explosives reported that the number of ghost gun seizures in the US has increased by more than 1000 per cent since 2017.

Second, interestingly, 95 per cent of the incidents were failed cases, i.e., the perpetrators were interdicted before the firearms could be discharged. Apart from the Mangione case, one of the few other high-profile cases where the weapon was successfully discharged and managed to cause harm was the 2019 Halle attack in Germany, where right-wing extremist Stephan Balliet was alleged to have used a

firearm with 3D-printed components. Two people were killed, and two others were injured in the attack.

Third, PKCs were found to be most common in North America, while hybrid firearms were most common in Europe. This is due to the differences in firearms regulations in both regions. Firearms are regulated in Europe, thus forcing potential criminals to manufacture them wholly by themselves. In most parts of the US, only the lower receivers are regulated. Hence, they are 3D-printed or privately manufactured and later supplemented by commercially available firearms components, as highlighted in the Mangione case.

Lethality is Dependent on Skill

3DPFs offer would-be criminals a cheaper, alternative avenue to weapons without having to depend on external networks. The proliferation of digital manuals and information online exacerbates this threat. However, it should be noted that manufacturing 3DPFs is not as easy as it seems. It requires a significant amount of time, experimentation, effort and patience. The quality and workability of a 3DPF depends highly on the maker's skill – a well-built 3DPF can be almost as good as a factory-made weapon, while the capabilities of ones that are not are severely limited.

3DPFs suffer from durability issues as they are made primarily from plastic. From the video footage of the shooting, Mangione's weapon appeared to have jammed several times. Balliet's weapon in 2019 also suffered from malfunctions and would have caused more damage had it not. Nevertheless, despite the guns not working optimally, they were still lethal. While these weapons may not be as effective as factory-made ones, Mangione's case clearly shows that they were effective in localised, small-scale, assassination-type incidents.

A Growing Threat

The Thompson assassination brings to light the growing danger of 3DPFs. The New York Police Department noted that the shooting has been celebrated among select groups of people on social media. Prospective criminals and extremists may emulate the modus operandi of using 3DPFs in future attacks. These weapons are a serious security concern globally. Strong legislation is key in dealing with the threat. Countries like Singapore and Canada have banned the possession of 3DPF design manuals.

Governments must foster cooperation with the private sector, including 3D-printing companies, to implement safety measures, ensure proper training for local police officers to detect these weapons, and increase public awareness. Some regions are currently more affected than others, but technological advancements will enable the threat to spread to previously unaffected areas. Pre-emptive and proactive measures are vital in dealing with the proliferation of 3DPFs.

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