Homeland Defense & Security Information Analysis Center

HDIAC TECHNICAL INQUIRY (TI) RESPONSE REPORT

3-D-Printed Ammunition: Possibilities and Security Risks

Report Number:

HDIAC-BCO-2025-679

Completed April 2025

HDIAC is a U.S. Department of Defense Information Analysis Center

MAIN OFFICE
4695 Millennium Drive
Belcamp, MD 21017-1505
Office: 443-360-4600

REPORT PREPARED BY:
Gregory Nichols
Office: Oak Ridge Associated Universities (ORAU)

HDIAC is sponsored by the Defense Technical Information Center, with policy oversight provided by the Office of the Under Secretary of Defense for Research and Engineering. HDIAC is operated by the SURVICE Engineering Company.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From – To)*
24-04-2025	Technical Research Report	

4. TITLE AND SUBTITLE
3-D-Printed Ammunition: Possibilities and Security Risks

5a. CONTRACT NUMBER
FA8075-21-D-0001

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Gregory P. Nichols

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Homeland Defense & Security Information Analysis Center (HDIAC)
SURVICE Engineering Company
4695 Millennium Drive
Belcamp, MD 21017-1505

8. PERFORMING ORGANIZATION REPORT NUMBER

HDIAC-BCO-2025-679

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Defense Technical Information Center (DTIC)
8725 John J. Kingman Road
Fort Belvoir, VA 22060-6218

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution Statement A. Approved for public release: distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The Homeland Defense and Security Information Analysis Center (HDIAC) received an inquiry from the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Counter-Improvised Collaboration Center (C3) regarding a report that the German Federal Police was made aware of a new kind of ammunition available on the market—9-mm hollow-point ammunition produced via three-dimensional (3-D) printing. HDIAC conducted a search using keywords relevant to the inquiry and reviewed appropriate online and peer-reviewed sources when available. No information regarding this specific threat was found; however, the search did identify relevant existing technologies and a high affinity among user communities to support the notion that it is possible to create 9-mm hollow-point rounds using 3-D-printing techniques. ATF-C3 also inquired about security risks related to 3-D printed rounds at airport security checkpoints. At this time, existing technology at many airports includes computed tomography scanners, which appear to be adequate in detecting 3-D printed weapons and will suffice in detecting most materials like metals and polymer composites, which are the primary source materials for 3-D-printed ammunition.

15. SUBJECT TERMS (PROVIDED BY AUTHOR)
3-D printing, additive manufacturing, weapons, ammunition, homeland security, terror threat

16. SECURITY CLASSIFICATION OF: U			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Ted Welsh, HDIAC Director
U	U	U		12	**19b. TELEPHONE NUMBER** *(include area code)* 443-360-4600

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

Distribution Statement A. Approved for public release: distribution is unlimited.

About

DTIC and HDIAC

The Defense Technical Information Center (DTIC) preserves, curates, and shares knowledge from the U.S. Department of Defense's (DoD's) annual multibillion-dollar investment in science and technology, multiplying the value and accelerating capability to the Warfighter. DTIC amplifies this investment by collecting information and enhancing the digital search, analysis, and collaboration tools that make information widely available to decision-makers, researchers, engineers, and scientists across the Department.

DTIC sponsors the DoD Information Analysis Centers (DoDIAC), which provide critical, flexible, and cutting-edge research and analysis to produce relevant and reusable scientific and technical information for acquisition program managers, DoD laboratories, Program Executive Offices, and Combatant Commands. The IACs are staffed by, or have access to, hundreds of scientists, engineers, and information specialists who provide research and analysis to customers with diverse, complex, and challenging requirements.

The Homeland Defense & Security Information Analysis Center (HDIAC) is a DoDIAC sponsored by DTIC to provide expertise in eight technical focus areas: alternative energy; biometrics; chemical, biological, radiological, and nuclear (CBRN) defense; critical infrastructure protection; cultural studies; homeland defense & security; medical; and weapons of mass destruction. HDIAC is operated by SURVICE Engineering Company under contract FA8075-21-D-0001.

TI Research

A chief service of the DoDIAC is free technical inquiry (TI) research limited to four research hours per inquiry. This TI response report summarizes the research findings of one such inquiry. Given the limited duration of the research effort, this report is not intended to be a deep, comprehensive analysis but rather a curated compilation of relevant information to give the reader/inquirer a "head start" or direction for continued research.

Abstract

The Homeland Defense and Security Information Analysis Center (HDIAC) received an inquiry from the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Counter-Improvised Collaboration Center (C3) regarding a report that the German Federal Police was made aware of a new kind of ammunition available on the market—9-mm hollow-point ammunition produced via three-dimensional (3-D) printing. HDIAC conducted a search using keywords relevant to the inquiry and reviewed appropriate online and peer-reviewed sources when available. No information regarding this specific threat was found; however, the search did identify relevant existing technologies and a high affinity among user communities to support the notion that it is possible to create 9-mm hollow-point rounds using 3-D-printing techniques. ATF-C3 also inquired about security risks related to 3-D-printed rounds at airport security checkpoints. At this time, existing technology at many airports includes computed tomography scanners, which appear to be adequate in detecting 3-D printed weapons and will likely suffice in detecting most materials like metals and polymer composites, which are the primary source materials for 3-D printed ammunition.

Contents

1.0 TI Request

1.1 Inquiry

An inquiry was received regarding what information exists on the availability and possible use of 9-mm, hollow-point ammunition produced with three-dimensional (3-D) printers and how this development could influence considerations of future aviation security controls.

1.2 Description

The German Federal Police was made aware of a new kind of ammunition available on the market—9-mm hollow-point ammunition produced with 3-D printers. Considering this report, the Bureau of Alcohol, Tobacco, Firearms and Explosives Counter-Improvised Collaboration Center is seeking further information on this kind of ammunition, especially regarding the following information:

- known incidents involving the ammunition,
- possible insights into mode of action and potential for damage, and
- detectability in aviation security checks.

2.0 TI Response

The Homeland Defense and Security Information Analysis Center (HDIAC) conducted an internet search using phrases and keywords related to the initial incident that brought this issue to light (i.e., German Federal Police; 9-mm, ammo/ammunition; bullets; hollow-point; 3-D printed/3-D printing; etc.). Several relevant websites were identified as well as a few relevant peer-reviewed journal articles. No specific information that matched the incident in question could be found; however, HDIAC did find many similar events and processes that match the concerns produced by the suspected report from the German Federal Police.

No specific information regarding reports from the German Federal Police of 9-mm hollow-points being produced through 3-D printing was found. Although no specific information related to the nature of the request could be found, the technology is available, and several relevant incidents have already been identified which indicate the feasibility of a potential incident.

This topic is extremely relevant to the U.S. Department of Defense (DoD) and other government agencies for several reasons. First, 3-D printing has already posed security challenges for hard

and soft targets, as production materials exist that can often elude detection. Second, it is difficult if not impossible to trace the production, manufacturing, and end products related to these types of devices. Third, the use of 3-D printing requires fewer and smaller facilities compared to traditional manufacturing methods and are easier to remain "off the grid." Finally, there are many public-facing websites and other resources that post information on how to print a variety of 3-D objects, including weapons and ammunition, that are completely within the realm of the law. These challenges pose security threats of which the DoD and other agencies, such as Department of Homeland Security and daughter agencies, must be aware.

2.1 Additive Manufacturing (AM) of Ammunition

It has been possible to 3-D print ammunition (bullets) since at least 2013 [1]. Research and development still continue across various groups. Although there is little information in open-sourced, peer-reviewed literature about 3-D printing of ammo or bullets, there is a whole host of online resources, blog posts, and media sites that contain information on 3-D-printed ammo. Chief among these are interest groups in hunting and sportsmanship sites that describe how 3-D printing of ammo can be created, as well as a host of law enforcement sites and 3-D printing enthusiast sites.

The concept of 3-D printing ammunition is growing. The following sites offer comprehensive views of the burgeoning situation, particularly those creating security concerns:

- "3D Printed Bullets: They Exist and Quite Simple to Make," by SpecialSTL at the following link: https://specialstl.com/article/3d-printed-bullets [2].
- "Flash Alert: 3d-Printed Ammunition - Primers, Casings, and Flare Launchers Found Worldwide," by William Bos et al. at the following link: https://www.counterterrorismgroup.com/post/flash-alert-3d-printed-ammunition-primers-casings-and-flare-launchers-found-worldwide [3].

2.1.1 9-mm and Hollow Points

No specific information could be found on 3-D printing of hollow point rounds. However, information was discovered regarding the successful printing of 9-mm bullets. As early as 2015, 9-mm rounds were produced using polylactic acid, a biocompatible plastic that is less toxic and easier to work with than acrylonitrile butadiene styrene [4].

2.1.2 Military and Defense Research

Much of the active research and production regarding 3-D-printed ammunition has taken place in DoD circles, mainly within the United States and Russia. As early as 2016, the Russian Fund for Perspective Research had been supporting work in developing 3-D-printed ammunition of various calibers [2]. And that same year, the U.S. Marine Corps (USMC) had also begun work on exploring 3-D printing for developing munitions to improve precision [5]. The U.S. Army began exploring the concept of 3-D-printed munitions in 2020 [6] through its Science of Additive Manufacturing for Next Generation Munitions Essential Research Program, which continues today [7]. The USMC continues to actively explore "ammunition-related additive manufacturing and research and development (R&D) projects" through its Program Manager (PM) ammo teams as part of the PM for combat support systems [8].

2.2 Detecting AM Products

Detecting 3-D-printed items at airport security checkpoints can create challenges, depending on the materials used. However, the Transportation Security Administration (TSA) has already successfully identified 3-D-printed weapons with existing X-ray detection technologies [9, 10] and there is no reason to believe other 3-D-printed items will go undetected. In fact, the technology that screens baggage is improving. New CT scanners are being deployed by the TSA at several airports, which is making it easier to more completely identify all the contents of a traveler's bag [11, 12].

References

[1] Koebler, J. "First 3-D Printed Bullets Fired in YouTube Test." https://www.usnews.com/news/articles/2013/05/22/first-3-d-printed-bullets-fired-in-youtube-test, accessed on 23 April 2025.

[2] SPECIALSTL. "3D Printed Bullets: They Exist and Quite Simple to Make." https://specialstl.com/article/3d-printed-bullets, accessed on 23 April 2025.

[3] Bos, W., I. Johnson, A. Labadi, M. Maya, N. Novak, and M. Sclaverano. "Flash Alert: 3D-Printed Ammunition - Primers, Casings, and Flare Launchers Found Worldwide." https://www.counterterrorismgroup.com/post/flash-alert-3d-printed-ammunition-primers-casings-and-flare-launchers-found-worldwide, accessed on 23 April 2025.

[4] Johnson, S. "3D Printing 9mm Bullets: Subsonic and Supersonic Loads." https://www.thefirearmblog.com/blog/2015/12/02/3d-printing-9mm-bullets-subsonic-and-supersonic-loads/, accessed on 23 April 2025.

[5] Mendoza, H. R. "Marine Corps Developing 3D Printed Munitions for Greater Precision." https://3dprint.com/151257/marines-3d-printed-munitions/, accessed on 23 April 2025.

[6] U.S. Army CCDC Army Research Laboratory Public Affairs. "Additive Manufacturing to Provide Soldiers With Cutting-Edge Munitions." https://www.army.mil/article/233054/additive_manufacturing_to_provide_soldiers_with_cutting_edge_munitions, accessed on 23 April 2025.

[7] U.S. Army Research Laboratory. "Science of Additive Manufacturing for Next Generation Munitions (SAMM)." The U.S. Army Combat Capabilities Development Command, https://arl.devcom.army.mil/what-we-do/samm/, accessed on 23 April 2025.

[8] USMC. "Ammunition." https://www.marcorsyscom.marines.mil/Program-Managers/Combat-Support-Systems/Ammunition/, PM Ammo Teams, accessed on 23 April 2025.

[9] Berti, A. "3D-Printed Guns Among Weapons Confiscated at US Airports." https://www.airport-technology.com/news/3d-printed-guns-among-weapons-confiscated-us-airports/, accessed on 23 April 2025.

[10] Gajanan, M. "The TSA Has Found 3D-Printed Guns at Airport Checkpoints 4 Times Since 2016." https://time.com/5356179/3d-printed-guns-tsa/, accessed on 23 April 2025.

[11] TSA. "TSA Installs New Automated Screening Lanes With Computed Tomography Scanners at BWI Airport Checkpoints in Time for the Busy Summer Travel Period." https://www.tsa.gov/news/press/releases/2024/07/01/tsa-installs-new-automated-screening-lanes-computed-tomography, accessed on 23 April 2025.

[12] TSA. "TSA Checkpoints at Newark Liberty International Airport Now Equipped With New State-of-the-Art 3-D Checkpoint Scanners to Improve Explosives Detection in Time for Summer Travel Season." https://www.tsa.gov/news/press/releases/2024/06/25/tsa-checkpoints-newark-liberty-international-airport-now-equipped, accessed on 23 April 2025.

Biography

Gregory Nichols is an HDIAC subject matter expert and public health professional certified in public health; a certified manager of quality/organizational excellence; and an associate safety professional known for his work evaluating risks and applications of emerging technologies in health, safety, and defense. He has 25 years of experience in healthcare, defense and homeland security, and environmental and occupational health research and has published and presented extensively on these topics. Mr. Nichols holds a B.A. in philosophy and an MPH in health planning and administration from the University of Tennessee.

Bibliography

Kramer, M. "3D Printers Defying German Weapons Legislation." https://www.msuilr.org/new-blog/2022/5/23/3d-printers-defying-german-weapons-legislation, accessed on 23 April 2025.

Mattijssen, E., W. Kerkhoff, R. Hermsen, and R. Hes. "Interpol Review of Forensic Firearm Examination 2019-2022." *Forensic Sci. Int. Synerg*., vol. 14, no. 6, December 2022.

Young, J. "3D Printed Bullets Developed and Tested by Russian Researchers." https://3dprint.com/156003/russia-3d-prints-bullets/, accessed on 23 April 2025.