Further information regarding 3D printers – Attachment B

The first commercial 3D printer was created in 1984 which utilised a process known as sterolithography in which layers are added by curing photopolymers with UV lasers. In the successive years 3D printing has expanded to include processes including:

- Extrusion – predominately thermoplastics;
- Wire – metal alloys;
- Granular – metals and thermoplastics;
- Powder – plaster; and
- Laminated – paper, metal and plastic films.

In summary 3D printing involves additive manufacturing in lieu of traditional metalworking processes that involve casting, fabrication, stamping, and removal of material such as via machining. While employing differing technologies both 3D printing and modern metalworking processes employing Computer Numerical Control (CNC) can manufacture three dimensional parts and components drawing upon Computer Assisted Design (CAD) files.

Due to the increased availability of advanced manufacturing capabilities such as 3D printers and CNC milling machines, combined with global access to electronic CAD files via the internet, parts and assemblies can now be economically created by individuals possessing relatively inexpensive (approx. $500) 3D printing machines. This technology has the potential for criminal applications through the production of illicit items such as illegal copies of objects or productions of firearms and/or components.

To date the most widely available form of 3D printing comprises that employing the extrusion method which utilised various forms of thermoplastics. The mechanical properties of thermoplastics place practical limitations on the components that can be manufactured. In relation to firearms, firing of thermoplastic 3D printed firearms usually results in "catastrophic" failure. This is due to the plastic used being unable to cope with the pressures created by the propellant gases.

3D printing processes such as granular based laser sintering systems have the capacity to produce high quality metal objects with material characteristics approaching that of traditional metalworking processes. In November 2013, 'Solid Concepts' in California reported 3D printing of the first metal gun. This was made of over 30 printed components using a high-end laser sintering system. It was reported that testing of this firearm was successful.

To date sintering systems have only being employed for industrial applications such as aerospace due to their significant cost. Technology however, continues to evolve with metal based granular processes expected to become more widely available in the future. This increased accessibility combined with ready availability of illicit firearms CAD files on the internet, has the potential to present future challenges to law enforcement surrounding illicit manufacturing of firearms and potential employment of thermoplastic 3D printed firearms that could evade x-ray detection (although some metal parts are still required).

The AFP Forensics Imaging and Geomatics (I&G) Team currently own one (1) 3D printer. The AFP has tested one printed 3D firearm, printed by the I&G team. When fired, the firearm failed. It is conceivable that with modification to the firearm or ammunition the firearm may be able to function. These modifications have not been tested.