College of Policing

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Assessment of TASER® 10™

User handling trial

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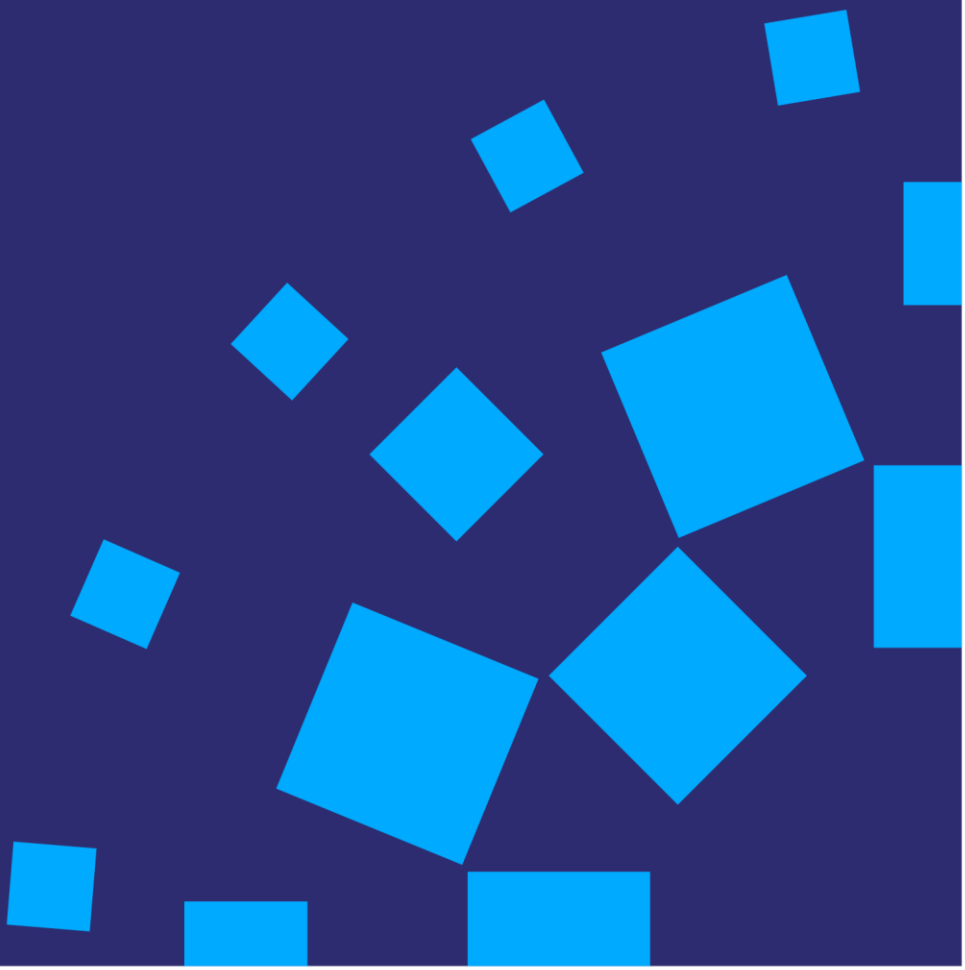

Executive summary

The College of Policing were tasked by the Home Office to conduct a user handling trial (UHT) of the TASER® 10™ (T10) conducted energy device (CED). This trial considered the performance of the device from a users' perspective in comparison with extant devices (TASER® X2™ and TASER® 7™).

The T10, is a novel design of CED fitted with a magazine of ten cartridges, each cartridge containing a single probe. Unlike the X26, X2 and T7, each probe is fired independently of one another, each activation of the trigger deploying one probe. A minimum of two probes is required to create a circuit, requiring a minimum of two trigger activations. The officer determines the probe spread in aiming the two probes, rather than it being a function of the cartridge angle and distance. The T10 cannot deliver a 'drive stun', nor arc through the air, the probes must be in the skin. Whilst it can deploy up to ten probes, a maximum of only four of these will be energised, which is the same as extant twin-cartridge CEDs when both cartridge bays have been fired.

A cohort of 27 police officers from nine different police forces/agencies undertook the trial. Of those 27, nine were women and 18 were men. Whilst a 50:50 split was desirable, this reflects the current make-up of the UK police service nationally, where approximately 34% of officers are women.

The 27 officers also included eight new users, ten X2 users and nine T7 users.

In total the trial has considered the performance of 42 T10 devices firing in excess of 4500 cartridges, over the course of 11 discrete exercises. This was during three user handling trials (UHT1 to 3).

The participants were surveyed to capture their thoughts in relation to T10 in comparison to their existing device. Generally, most officers preferred the T10 to their existing device when considering most aspects. The two areas that did generate some negative comment was the potential effectiveness of the simulated warning display in lieu of the conventional arc display and multi-function aspect of the T10 selector switch.

The T10 can no longer produce a conventional arc display and uses a strobe light and audio alert to simulate such a display. In the post-trial questionnaire, 11/26

(42.3%) trial participants commented on the T10's warning display. These comments were uniformly negative on the potential deterrent effect of the warning display in practice.

In addition, the selector switch of the T10 now combines the functionality of both the safety switch and arc button of the X2 and T7. In the post-trial questionnaire, 10/26 (38.5%) participants expressed a negative view, citing physical and complexity issues. 5/26 participants gave a qualified positive response while one participant was entirely positive.

The impact of personal characteristics was considered during the trial including sex/gender of the officer, their dominant hand (left and right-handed officers were included in the trial), their dominant eye and whether this was on the opposite side to their dominant hand, and physical characteristics such as height and hand size.

Inevitably with a 'one size fits all' device there were some comments that the grip of the device was too small or too big, but despite this all the officers were able to operate the T10 safely and accurately. This issue is not limited to the T10 and is something that extant devices would also have in common to some degree. However, looking to the future it would be desirable if the differing hand size of officers could be better accommodated.

Instructors were also surveyed and overall, their views of the T10, from a training perspective were positive, with most considering it an 'easier' device to train officers in, particularly given the low complexity of aiming probes singularly.

Whilst this assessment of the Taser 10 system was primarily a user handling trial, data was also captured in relation to reliability. Faults were categorised as

- A Critical
- B Major
- C Identified
- D Fault cleared through trouble shooting
- E Negligible

During the first user handling trial (UHT1, n=684) 4.25% of exercise attempts had a cat A fault. As a result, feedback was provided to Axon who updated the firmware of the device.

A further trial was undertaken (reliability only, UHT2, n=486). In comparison to UHT1 Cat A faults decreased to 3.29%, however cat B faults increased to 4.94% (UHT1= 0%) and cat C to 11.52% (UHT1=1.8%).

Axon suggested these issues would be largely resolved by a new revision of the device (rev B) and updated firmware (version 1.4.9).

A third trial was conducted (UHT3, n=538). Cat A faults fell further to 1.85%, cat B to 2.6% and cat C to 1.85%. In addition, of the cat A faults, except for two exercise attempts (0.38%), given the ten-shot capability of the T10, the officer could mitigate the fault and continue to deploy probes.

Should the T10 be adopted, it is anticipated it would be subject to enhanced monitoring and data recording. It is recommended that the fault types, and their associated symptoms, are included in instructor training and inform user training. This could assist in raising awareness and recording of such issues. The T10 should also be subject to a robust process that shares experience so such issues can be monitored, awareness raised, and solutions shared amongst all T10 forces/agencies.

It would also be advisable for Axon, as the supplier and manufacturer, to continue to engage in this process to maintain and improve a culture of continuous improvement and enhanced reliability of their products.

Overall, the T10 was found to be more accurate than existing devices and was generally popular amongst officers and instructors. Officers could deliver probes rapidly and safely and have more flexibility with probe placement than with existing devices. However, it should be recognised that the T10 requires probes to be in the subject’s skin, as they can no longer arc an air gap, unlike the X2 and T7. Whilst the preliminary steps of accurate and selective probe placement, based on this research, are established, the ability of the probes to engage the skin through clothing is beyond the scope of this evaluation.

The findings of the handling trial are summarised by a number of key findings:

1. The Taser 10 is more accurate, and has lower probe dispersion, than extant CEDs at 3 to 5m with the laser sight. This may be as result of improved intrinsic accuracy but also assisted by the relatively low complexity of aiming one probe at a time.

2. Notwithstanding other factors, such as thick clothing, it is reasonable to conclude that a Taser 10 has sufficient practical accuracy to be used at distances up to 10m with the laser sight. Being able to operate a CED from further away has several benefits, including the ability to give a subject more ‘space’ to aid de-escalation and, where deployed alongside firearms, reduce the likelihood of resorting to conventional firearms where extant CEDs would be outside their effective range.

   In addition, on average, the T10 was more accurate and consistent at 10m than both the X2 and T7 were at half that distance.

3. Consistent with the findings in relation to the laser sight, the T10 again proved to be the most accurate device of the three with fixed sights at 5m.

4. In the hands of a proficient user using the fixed sight, the device remains accurate at 10m, although greater accuracy would be achieved using the laser sight.

5. At the time of writing the intrinsic accuracy of the device has yet to be examined but based on these data it would appear the practical accuracy of the device at or near its maximum range (13.7m), with both sight systems, was more limited in comparison to 10m or less. However, accuracy was seen to improve when New Users were excluded from the analysis, suggesting the device remains accurate in the hands of proficient users.

6. Given the nature of individually aimed probes of the T10 system, one could contend it is far easier to deliver probes to subjects in a supine, or other unconventional posture, than with the fixed probe spread of extant systems. In addition, in this test, the probes were delivered with greater accuracy and consistency than with either an X2 or T7.

7. The T10 can deliver probes rapidly and accurately. Should the first four probes fail in their attempt to create incapacitation, an officer with a T10 can

swiftly deliver further probes, where their colleagues with an X2 or T7 would have to reload. Often this may not be an available option, due to the rapidly evolving nature of the incident and/or significant time taken to complete such an action. It also should be recognised that probes must be in the skin for T10 to create effective NMI and relevant training strategies are required to embed this concept.

8. The T10, in exercise 6, had a low rate of missed shots. The rate of shots to sensitive areas was less when comparing the T10 to the X2.

   Although the T7 had no shots to sensitive areas, its high probe miss rate (two or three times that of the X2 and T10) makes unsafe any comparison with the other two devices. (See exercise 7 below)

   The need for officers to avoid shots to sensitive areas, where possible, must remain a key requirement in training.

9. Where confronted with an approaching subject, officers, on average engaged the subject at 8.2m. Notwithstanding the limitations of this exercise, these data may inform training design.

10. During exercise 7 (mini scenarios), the frequency of shots that missed or hit a sensitive area was low for the T10 and broadly similar to that of extant devices, and lower than such rates in operational use.

11. Although it was a rare occurrence, it is recommended training recognises that damaged T10 probes may have an unconventional ‘sharps’ hazard where probes are damaged.

12. It is recommended training recognises that in order to operate a warning alert the T10 device must momentarily be in the armed position first.

13. Based on observations over the course of the three trials, the batteries in the Taser 10 performed well, only losing 20% of their indicated charge despite extensive use.

14. Training of instructors should recognise both the potential HALT cartridge jamming issue and detached collar, and the simple expedients to resolve them.

15. Category A faults have more than halved in UHT3 compared to UHT1, and except for two exercises (0.37%), the officer could continue to operate the device and mitigate the issue.

    However, whilst category B and C faults reduced, they remain to some degree. Principally this relates to warning tones extending past expected timeframe and CID misreads.

16. Whilst the event log does give an approximation of the deployment distance on most occasions, it is notable that it is incorrect by a significant margin on some deployments.

    Noting the limitations and caveats associated with this analysis, it is recommended that such potential discrepancies are noted in the absence of any more conclusive assessment.

    (Links to the key findings within the body of the report can be found **below**).

Key findings

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TASER 10™ user handling trial - introduction

Conducted energy devices (CEDs), often referred to by the brand name TASER®, are defined in the College of Policing's authorised professional practice[1] (APP) as follows:

> *A CED is a less lethal weapon system designed to temporarily incapacitate a subject through use of an electrical current that temporarily interferes with the body's neuromuscular system and produces a sensation of intense pain.*
>
> *It is one of a number of tactical options available when dealing with an incident with the potential for conflict.*

The CEDs currently in service with the police in the UK are; the TASER® X26™, TASER® X2™ and TASER® 7™ (T7). They are all manufactured by Axon® Enterprise Inc. based in Arizona, USA.

CEDs were first introduced into UK policing in an operational trial in 2003 using the now obsolete M26 model. Following the trial, and the acceptance of CEDs into policing, this was followed by the X26 in 2005, X2 in 2017 and the T7 in 2020.

The X26 ceased production in 2015. Batteries and cartridges remain available for the X26 at the time of writing.

The manufacturer issued an 'end of life notice' for the X2 in March 2023, indicating devices will no longer be available from April 2024. However, ancillaries (e.g. cartridges and batteries) and warranty support will be available for a minimum of five years.

Whilst the X26 remains in service, the vast majority of forces, and policing roles, have migrated to the X2. Some have migrated to the newer T7, but current estimates indicate this is only approximately 14%[2]. The overwhelming majority of CED discharges in the UK are with the X2.

[1] **Conducted energy devices (Taser) | College of Policing**
[2] NPCC LLW, capability and capacity review 22/23

As X2 devices reach the end of their useful life and require replacement it is anticipated forces would want to procure the latest and most effective device, whilst ensuring they are safe, usable and offer best value.

Previous work

Prior to the introduction of the Taser X2 it was subject of assessment by The Home Office Centre for Science and Technology (CAST)[3]. Similarly, the T7 was also subject of assessment by the Defence Science and Technology Laboratory (Dstl)[4]. The College supported both of these trials with technical advice, training the participants and the safe conduct of the user handling trial.

This assessment broadly follows the approach adopted by both CAST and Dstl as regards user handling trials.

In addition, the authors have managed and conducted two previous trials, a T7 supplementary accuracy trial (2020)[5] and an additional trial considering the possible implications of colour vision deficiency (2020)[6].

The Code of Practice and systems approach

Less lethal weapons (LLW) such as CEDs are subject to The Code of Practice on Armed Policing and Police Use of Less Lethal Weapons 2020[7] (The Code). The Code states:

> *5.1.1 The Home Office and the national police lead for less lethal weapons should monitor the continuing research into, and the development of, acceptable and effective less lethal weapon systems in response to an evolving operational requirement and capability gaps.*

[3] CED Replacement Project, Assessment of the TASER X2™ against the Police Operational Requirements, CAST Publication No.057/16 https://www.gov.uk/government/publications/cast-assessment-of-the-taserx2
[4] Physical Assessment of TASER 7™, Dstl/TR117685 v1.0, 13 March 2020
[5] **T7_Supplementary_Accuracy_Report.pdf (publishing.service.gov.uk)**
[6] CVD and Taser Response to Dstl and SACMILL recommendations, College of Policing, October 2020
[7] **Code of Practice on Armed Policing and Police use of Less Lethal Weapons January 2020 (publishing.service.gov.uk)**

> *5.1.2 The strategic objective of the development of new weapon systems is to provide police officers with less lethal tactical options which will:*
>
> - *reduce the reliance on conventional firearms and ammunition*
> - *allow police officers to achieve a lawful objective when the force used is reasonable and proportionate in the circumstances.*

It further states (emphasis added):

> *5.1.3* ***New less lethal weapon systems*** *and significant changes to pre-approved less lethal weapons systems will* ***require approval by the Home Office before they can be used by police forces in England and Wales****. This approval process is required because of the unique risks and societal implications that apply to use of less lethal weapons, including the careful balance that needs to be struck between them being as effective as possible while also minimising risk of serious or permanent injury or death. All changes to less lethal weapons must be referred to the national policing lead and the Home Office for consideration.*

Both APP and The Code recognise that a LLW is more than just a device or weapon, but an entire system. The Code states:

> *As set out in the APP-AP, the less lethal aspect does not derive from the weapon or munitions alone but from the weapon system, and it is this which is assessed by an independent medical advisory body before the system can be approved for use.*

The evaluation of the Taser 10 by the College will consider it as a system rather than just a device, commensurate with the requirements of The Code.

This evaluation considers the system from a users' perspective, in the form of a user handling trial. It is not a technical evaluation. The technical evaluation is to be conducted by an appropriate body appointed by the Home Office.

This report is not intended to decide on the suitability of the Taser 10 system for use in the UK, but rather inform such a decision which clearly rests with the Home Secretary.

The TASER 10™ system

CEDs currently in operational use

Ever since the introduction of the first CED into UK policing, Taser CEDs have all used a similar principle. They simultaneously fire two probes at a pre-determined angle to one another. The probes are connected to the device by thin wires which allow the device to discharge pulsed electricity into a subject to produce neuro muscular incapacitation (NMI).

Training in Taser devices by the College, based on Ho *et al* (2012)[8], recognise that the effectiveness of NMI is determined by the distance the two probes are apart, commonly referred to as 'probe spread'. In devices to date, the probe spread is a function of distance to the subject and the pre-determined angle of the two probes. For the X26 this was 8° and for the X2 7°. The T7 has two cartridges; 'close quarter' (CQ), which is 12° and 'stand off' (SO) which is 3.5°. The concept is illustrated by a T7 in figure 1, below.

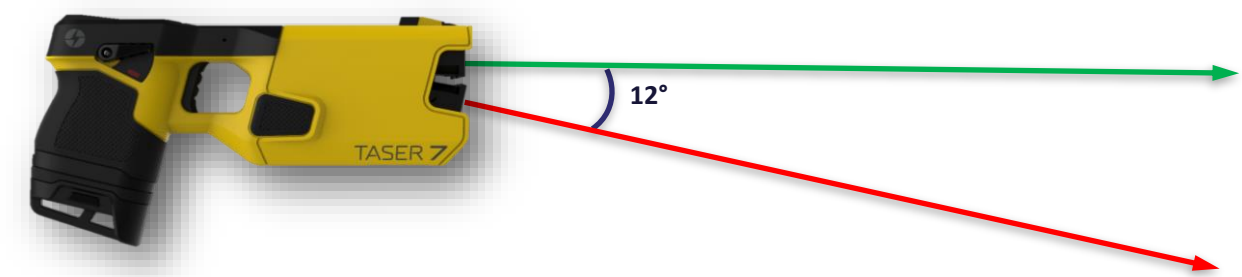


Figure 1, fixed probe spread

Whilst the angle may vary between models and cartridges, ultimately the angle, and therefore the probe spread, has been determined by the cartridge design.

TASER 10

The TASER 10 (T10), illustrated in figure 2, is a novel design of conducted energy device fitted with a magazine that holds up to ten cartridges. Each cartridge contains a single probe connected to the device by a wire. Unlike the X26, X2 and T7, each probe is fired independently of one another. In essence one activation of the trigger

[8] Ho, J., Dawes, D., Miner, J. *et al.* Conducted electrical weapon incapacitation during a goal-directed task as a function of probe spread. *Forensic Sci Med Pathol 8*, 358–366 (2012).

deploys one probe. It remains necessary to fire a minimum of two probes to create a circuit, therefore requiring officers to activate the trigger at least twice as opposed to once with extant devices. With the T10 it is the officer that determines the probe spread in aiming the two probes, rather than it being a function of the cartridge angle and distance.

Figure 2, TASER 10 side view, © AXON Inc.

In common with extant CEDs the device has a safety switch, trigger, laser sight, supplementary fixed sights, a torch (flashlight), central information display and battery.

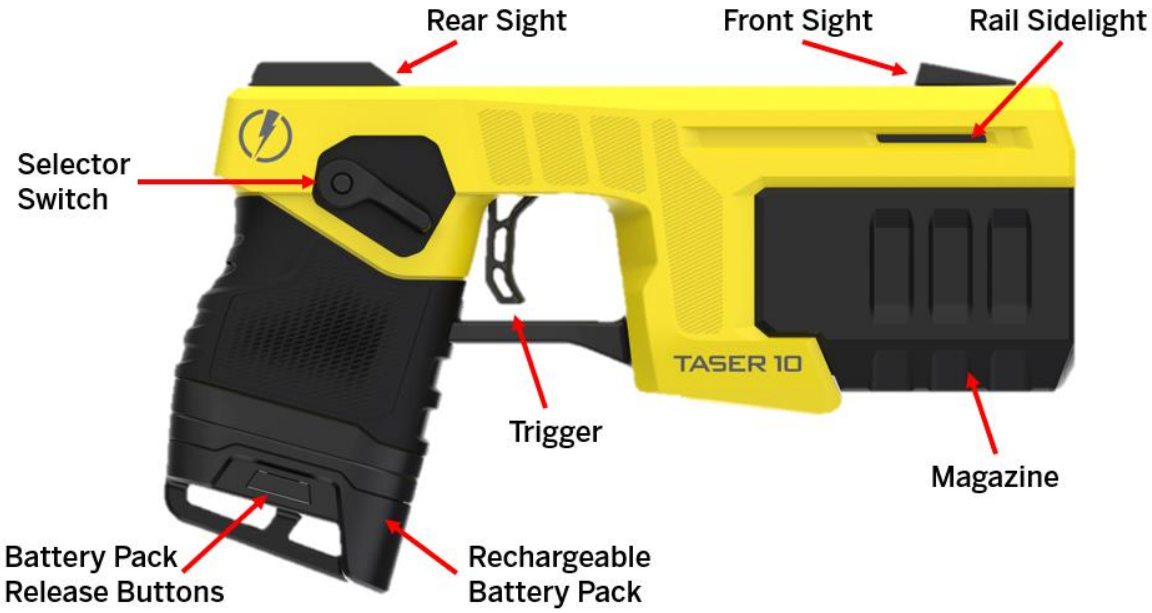


Figure 3, TASER 10 nomenclature, © AXON Inc.

Of note is the form factor, positioning of the trigger, safety switch and sighting systems remains broadly consistent with extant CEDs. Novel features include the magazine and rail side light. Unlike the X2 and T7 it is not fitted with a separate ‘arc switch’.

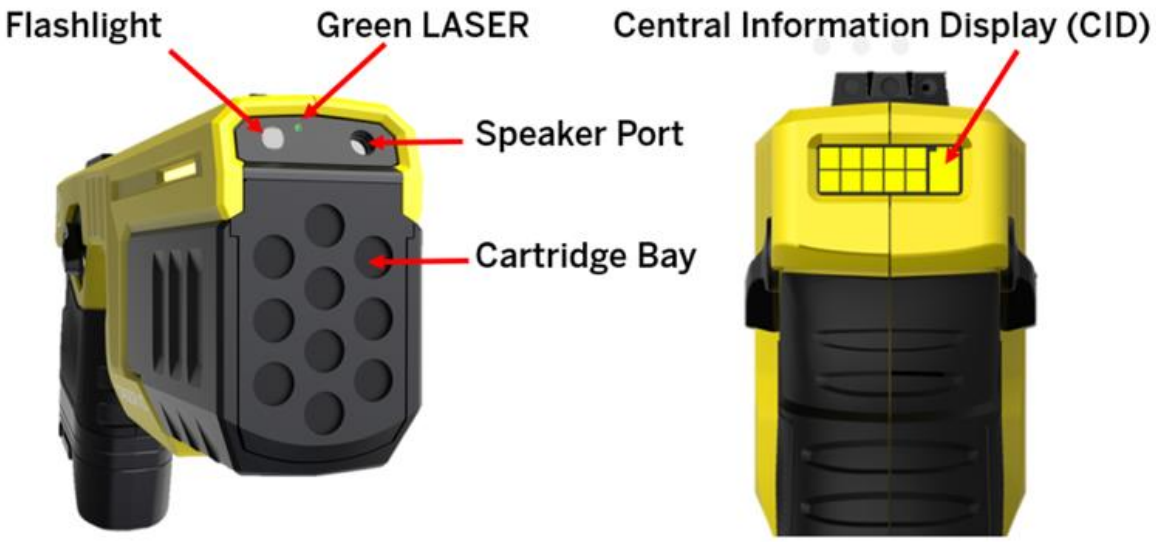


Figure 4, TASER 10 nomenclature cont. © AXON Inc.

Safety switch (selector switch)

All CEDs to date have been fitted with an ambidextrous safety switch which simply turns the power on, arms and readies the device for use, up being armed and down being safe. Switching the safety switch ‘off’ cuts the charge the device may be delivering. The safety switch on the T10 performs a similar function in that it may arm, or power up, the device and cut the power. However, it also offers additional functionality, similar to the ‘arc switch’ of the X2 and T7, for this reason Axon refer to it as a ‘selector switch’ rather than a safety switch.

Figure 5, selector switch positions, © AXON Inc.

Momentarily pressing the safety switch up beyond the armed position either activates a warning alert, when no probes have been fired, or re-energises deployed probes. Similarly pressing down beyond the ‘safe’ position can access ‘function test mode’ (used to determine the device is operating correctly at point of issue) or enter stealth mode (without the use of the laser and torch).

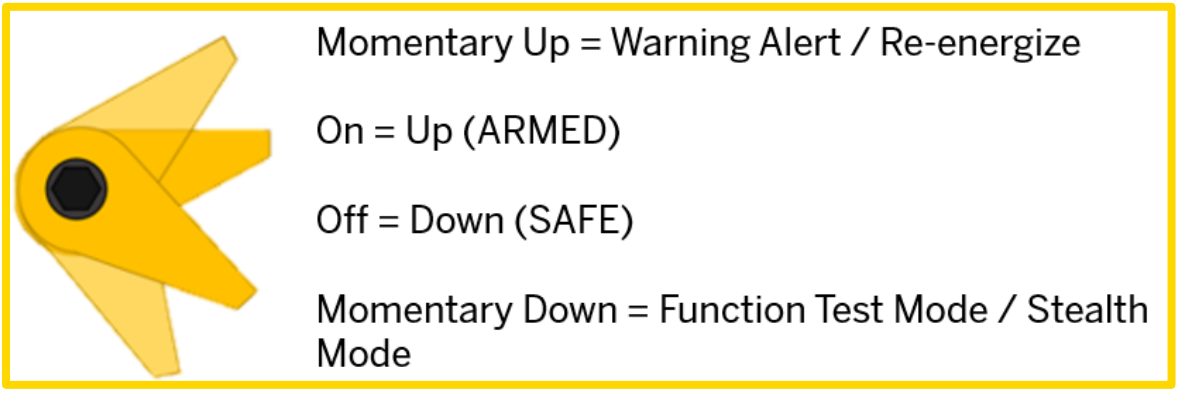


Figure 6, TASER 10 selector switch functions, © AXON Inc.

Trigger

In common with the form factor of extant CEDs, the T10 is of pistol type design with a trigger positioned within a trigger guard ahead of the grip. This should allow natural alignment of the index finger when held in the hand.

The X26 and X2 have a plastic ‘pistol type’ trigger blade that mechanically activates a microswitch within the body of the device. The T7 has a pressure pad rather than a more conventional trigger that does not require physical movement to activate, simply pressure applied to it. The T10 reverts to a more conventional trigger blade arrangement.

Figure 7, CED trigger comparison, T10 (left), X2 (centre), T7 (right)

As previously discussed, once the device is loaded and armed, activating the trigger fires a cartridge from within the magazine and deploys a single probe. Further activations of the trigger will deploy further probes until the magazine is exhausted.

Magazine and loading

The device is fitted with a reloadable magazine that holds up to ten cartridges.

Figure 8, TASER 10 loading process, © AXON Inc.

Once the magazine has been loaded with cartridges it can be fitted to the device as shown in figure 8.

Axon supply four different magazines (see figure 9).

Figure 9, T10 magazines, © AXON Inc

The black magazine is referred as the ‘standard duty’ magazine, for operational use. The purple magazine is a training magazine that fires standard live cartridges but is recognised by the device data log as a training event.

The blue magazine is known as a HALT (hook and loop training) magazine that is used in scenario-based training and fires probes fitted with ‘hook’ type material that can engage with a role player in a suit made from the corresponding ‘loop’ type fabric.

The red magazine is an ‘inert’ training magazine that allows drill type training to be conducted, without the risk of firing probes, whilst maintaining the functionality of the device. Such a magazine is required as if spent cartridges and magazines were used, the device would recognise this and not perform as required or expected for a given training drill.

This assessment considers the performance of the black standard duty magazine and the blue HALT magazine. The red inert magazine has been used by the College in preparation for this assessment and was found to be fit for its intended purpose but was not formally evaluated. The purple training magazine was not tested, largely as the functionality it provides is largely redundant given how the UK delivers training with dedicated training devices. However, it may have some merit in identifying training magazines, which may be subject to higher wear and tear, from operational magazines. This may assist forces in segregating training stock.

Laser sight

The T10 is fitted with a single class 3R green laser that projects on to the subject showing where the device is being aimed. The device carries a warning label showing the laser classification.

According to Axon the sight is zeroed at 33ft (approximately 10m).

Figure 10, laser classification label

Fixed sights

If ambient light is too bright for the laser sight to be seen or there is a requirement to not prematurely alert a subject through the use of a laser sight, fixed sights are available (figure 11).

Figure 11, fixed sights X26, X2, T7 and T10 (not to scale)

Torch

The device is fitted with a torch, referred to as a 'flashlight' by the manufacturer, for low-light use. The manufacturer's information[9] suggests the torch is 210 lumens, similar to that of the T7 in normal use. It can be used as part of the 'warning display' (see page 37 below) with a strobe effect up to 1000 lumens.

[9] **axon one page taser energy weapon comparison**

Central information display

The central information display (CID) on a T10 (figure 12) is in a common location with extant devices. However, it is of a unique design providing information to the user on device status. Unlike existing devices, which only display in monochrome yellow, the T10 CID is a full colour animated display.

Figure 12, T10 central information display, © AXON Inc.

Figure 13 illustrates some of the information available via the CID.

The magazine error, battery error, critical error, cartridge error and battery sync, all

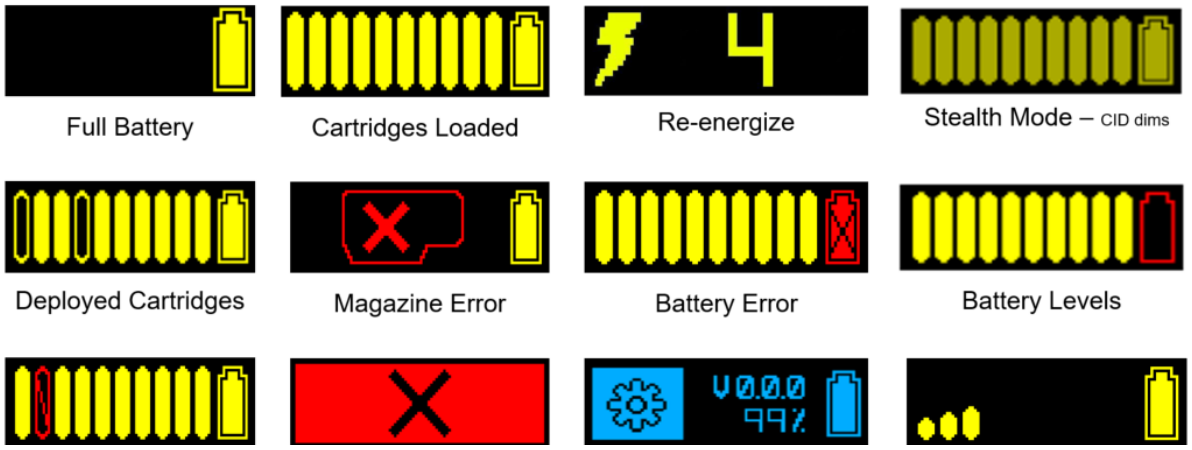


Figure 13, CID information, © AXON Inc.

'flash' and/or make use of some form of animation.

Serial number and auditing

Figure 14, device serial number and revision designation

Each device carries a unique serial number on the underside of the trigger guard, consistent with the requirements of the Firearms Act 1968, along with a 2D bar code. A revision designation is also included, which uses a convention of consecutive letters. As can be seen in figure 14, this device is revision A.

Taser 10 devices, batteries, magazines and cartridges also make use of near-field communication (NFC) technology. This allows a technician to conduct basic device management using the Axon Device Manager application on a compatible device, such as a smart phone (see figure 15). The app is available on iOS and Android operating systems.

This system is also compatible with Taser 7 and X2 CEDs.

More extensive management and auditing can be accessed via the website, evidence.com.

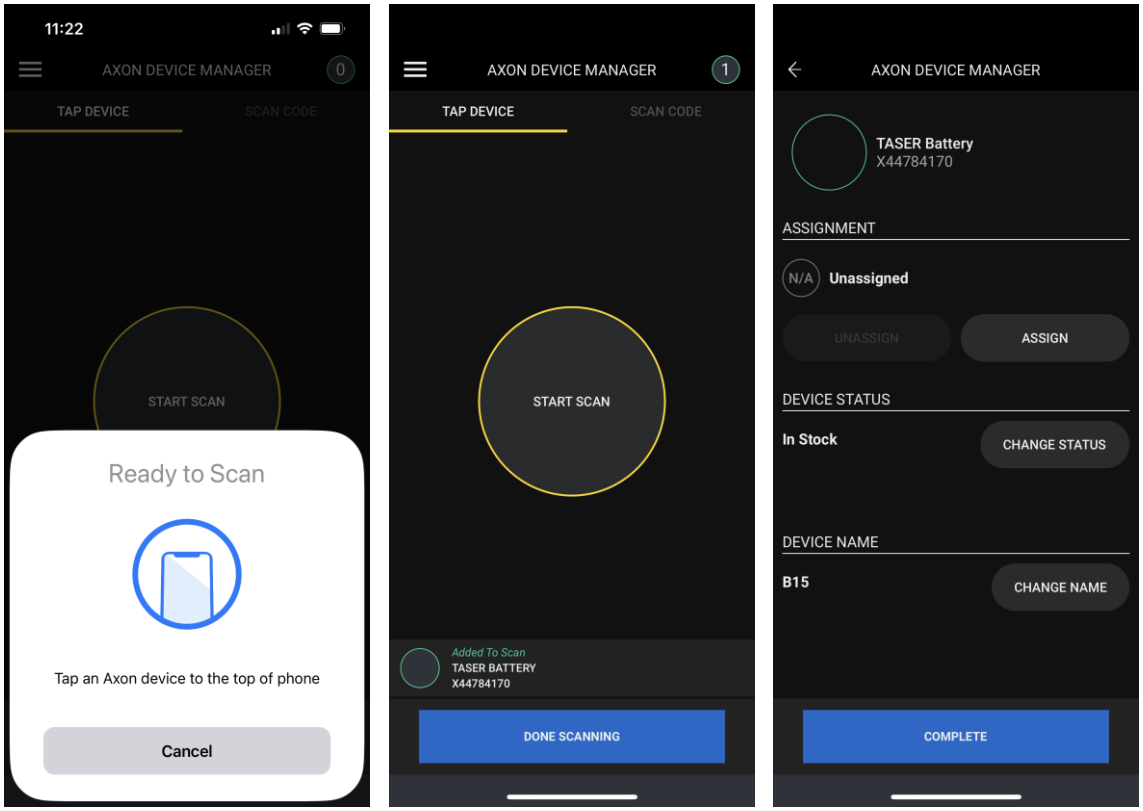


Figure 15, Axon device manager, iOS version

Battery system

The battery pack is a rechargeable lithium-ion cell that powers the device. The battery pack acts as a power source, contains data from the device (event logs, fault data, etc.) and is used to update the firmware.

The battery system is common to both the T10 and existing T7 device, although it must be initially configured for a particular device, to ensure it has the appropriate firmware.

When the battery is removed from a device it essentially copies the device data logs and, upon docking the battery, transfers the data to a secure cloud-based system provided by Axon, known as Axon Evidence or evidence.com. (See data transfer and auditing below.)

Cartridges and probes

The cartridge design for the Taser 10 differs in several ways from extant CEDs. As already discussed, it contains a single probe and over 45ft (13.72m) of wire wound within the probe body. It does not make use of compressed nitrogen as a propellant, as extant devices, rather it uses an ‘electrically fired primer’.

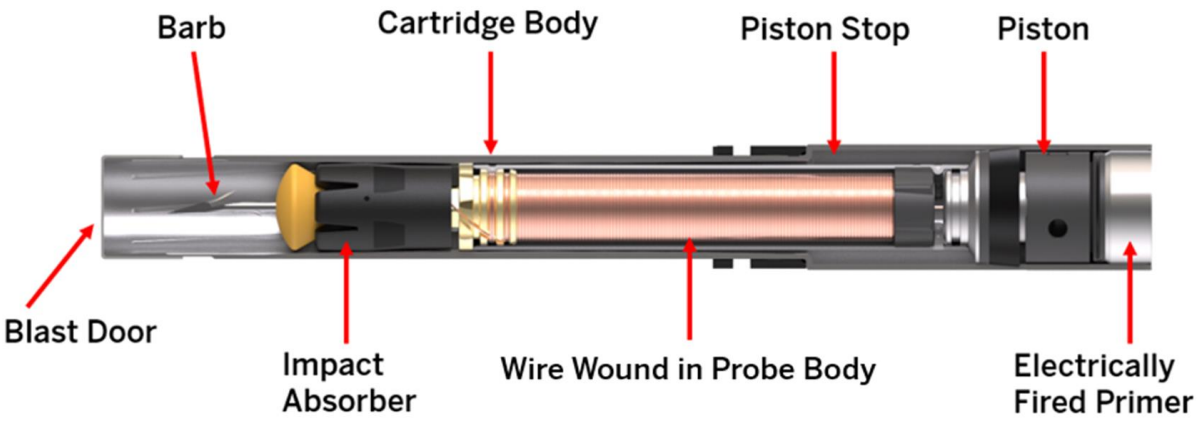


Figure 16, Taser 10 cartridge cutaway, © AXON Inc.

The probe itself has a barbed dart type tip, and impact absorber. The dart is approximately 11mm in length (see figure 17), however one could speculate this dart

Figure 17, Taser 10 dart

length could increase as the impact absorber compresses upon impact. (See figure 18).

This compares to dart lengths of 9.65mm for the X26, 11.5mm for the X2[10], and 11.5mm T7[11].

Figure 18, Taser 10 probe with compressed impact absorber

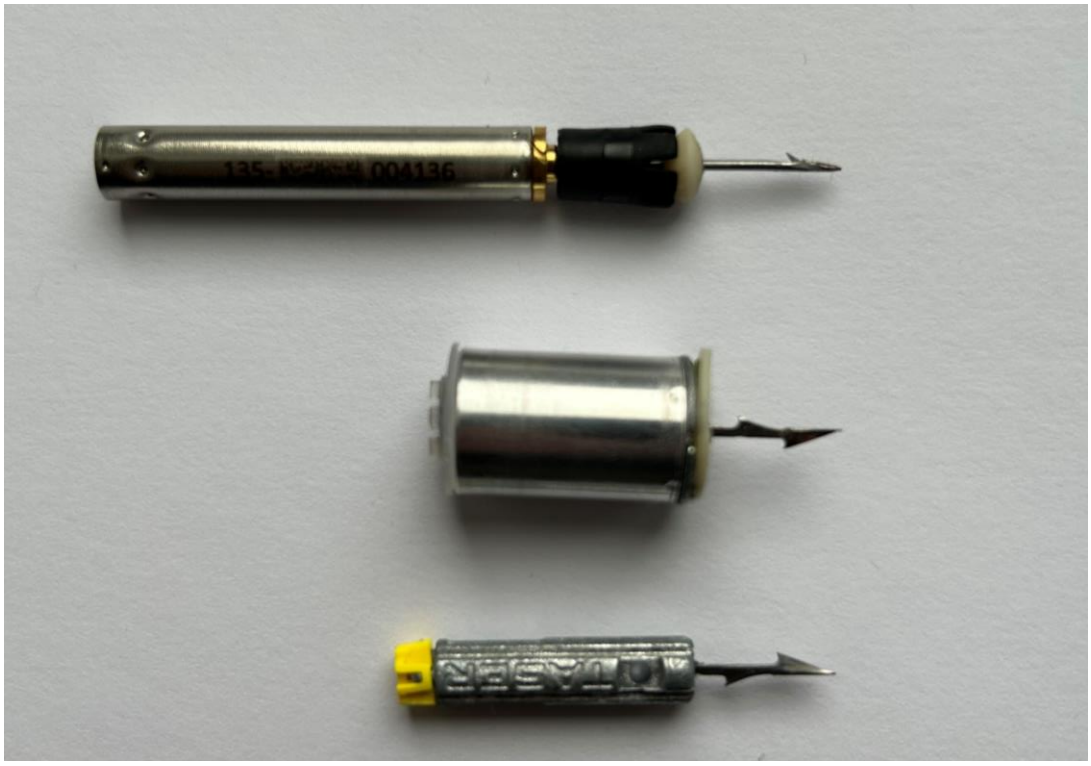


Figure 19, probe comparison T10 (top), T7 (middle), X2 (bottom)

[10] CED Replacement Project, Assessment of the TASER X2™ against the Police Operational Requirements, CAST Publication No.057/16 https://www.gov.uk/government/publications/cast-assessment-of-the-taserx2

[11] Physical Assessment of TASER 7™, Dstl/TR117685 v1.0, 13 March 2020

The dart and barb design appears similar to the earlier X26 type, rather than the flatter broader design of the X2 and T7. Earlier iterations of the probe featured two

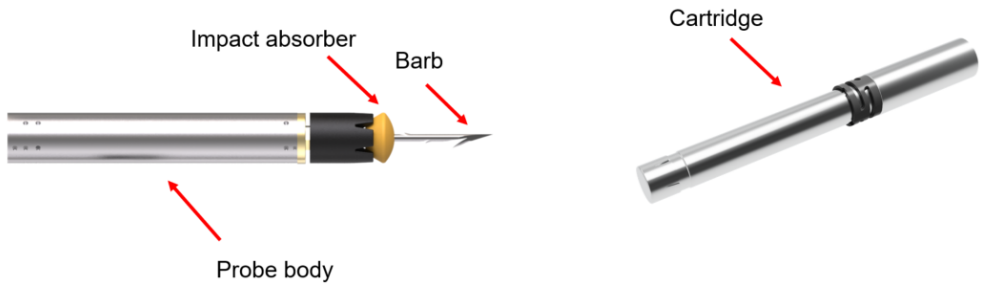


Figure 20, Taser 10 probe and cartridge, © AXON Inc.

additional smaller barbs, as can be observed in figure 17 and 20 above. Later revisions feature only a single main barb.

The blast door is of a foil type material and does not make use of an ejector as the X26, X2 and T7 do. One would assume this is because the blast door is significantly smaller and is 'torn' through by the probe, rather than pushed out of the way, therefore it does not require an ejector. Of note is the X26, X2 and T7 have experienced 'trapped ejectors', with varying frequency, that can impact successful deployment.

Although the maximum range of the device is quoted by Axon as 45ft (13.7m), being limited by the length of the wire, their training material indicates the maximum 'effective' range is 40ft (12.2m)[12].

A hook and loop training (HALT) cartridge is also available, for scenario-based training using a similar HALT system to the X2 and T7. The probe has a 'hook' type fabric and can be fired against a role actor in a suit made of the corresponding 'loop' type material. This is used extensively for scenario-based training in the UK.

[12] Axon_T10_Instructor_PowerPoint_0523_en_US, slide 55, 1st May 2023

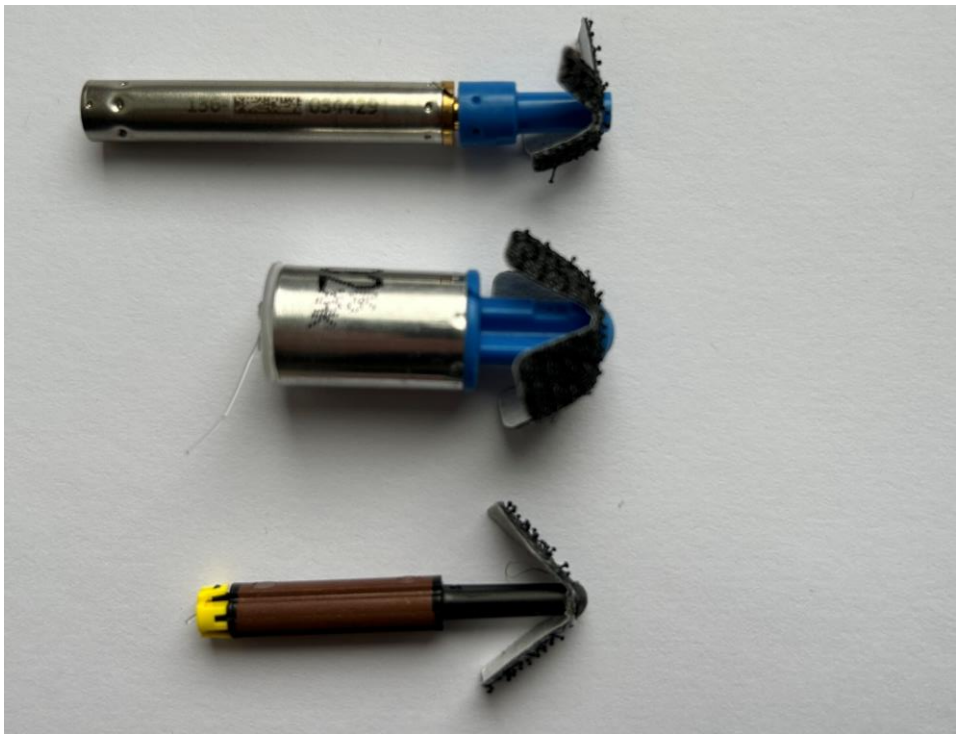


Figure 21, HALT probe comparison, T10 (top), T7 (middle), X2 (bottom)

The cartridge is distinguishable from the live counterpart by a colour coded collar and the absence of a blast door.

Figure 22, live and HALT cartridge comparison

The blue collar on the HALT cartridge is approximately 4mm in depth and the live cartridge black collar is 6.26mm. This is presumably to ensure they are only compatible with the corresponding magazine that uses the same colour convention.

The black collar differs in design in that it has small cut-outs, this allows it to compress, which may limit its effectiveness in preventing it being chambered within a blue magazine.

It has also been observed the collars are a ‘push fit’ and whilst they have not been seen to fall off accidentally, they can be easily removed. Theoretically it would be possible to switch the collars, but it is difficult to foresee how or why this could occur.

Each individual cartridge is serial numbered. The probe is also serial numbered however, at the time of writing the cartridge and probe serial numbers do not match and the probe serial number is not readily auditable by the force concerned. This is because it is not revealed until it has been fired. However, conversations with Axon have revealed that they maintain records of cartridge/probe serial numbers and could provide this information where required. It would be desirable if the cartridge and probe serial numbers corresponded to one another to make them more readily auditable.

Automatic shutdown

The X26 CED delivers a default five second electrical discharge, although it could be extended by the officer by holding the trigger. The X2 introduced an ‘auto shutdown’ feature, using a compatible battery (auto-shutdown performance power magazine - APPM). This automatically stopped the discharge after five seconds even if the trigger was held, although the officer could extend the cycle through use of the arc switch. This was to avoid inadvertent cycles beyond five seconds where the officer unconsciously held the trigger down. The T7 also has a similar feature built into the device, which is an agency configurable feature (i.e. by those with administrative rights, not the user).

The X2 and T7 have always had this auto shutdown feature enabled in the UK as matter of policy under the agreed system.

The T10 maintains this configurable feature and was configured as such for the purpose of the user handling trial.

Warning display

A key feature of CEDs since their introduction has been the ability to demonstrate to a subject the arcing effect across the front of the device, referred to as an ‘arc

display'[13]. This has served to reinforce verbal warnings in an effort to de-escalate situations. With the X26 device it was necessary to unload the CED to do so. This was unnecessary with both the X2 and T7, as an arc display can be conducted with cartridges loaded.

As the T10 waveform does not have a brief initial very high voltage arc phase, the device is unable to generate an arc warning display. As a result, arc displays, in the conventional sense, are no longer possible.

The T10 has an alternative based on emitted light and sound as an auditory and visual 'warning display'. The sound is emitted from the in-built speaker and the visual display uses the torch at a higher output (1000 lumens[14]) with a strobe type effect.

This can be initiated by the officer using the selector switch.

Cross connect

The Taser X2 introduced the concept of 'cross connect' where probes from different cartridges could be connected to complete a circuit. It still required a probe with positive (top) and negative (bottom) polarity to complete a circuit. Where more than one circuit, or path, was available, the X2 used the path with the least resistance.

The T7 developed this concept further with 'adaptive cross connect' where essentially it attempts all the possible circuits/probe combinations and employs the theoretically most effective. However, a positive and negative probe from the same device is still required.

The T10 introduces a system called 'any probe connect'. It no longer has pre-designated polarity and is able to create a circuit from any combination of skin-penetrating probes, with a maximum of four probes energised at any one time. To quote the manufacturer[15]:

> *ANY-PROBE CONNECT*

[13] **Conducted energy devices (Taser) | College of Policing**
[14] **taser-10-product-card-1**
[15] **taser-10-product-card-1**

Intelligent, any-probe connect with spread optimizer energizes up to 4 probes at once to maximize the effectiveness of the probe deployment.

‘Stealth’ mode

All CEDs to date have the ability to disable the laser sight and rely on the fixed sight instead. This may be employed for operational benefits, such as avoiding alerting a subject. It is not something that is routinely used operationally, but does have some relevant application, such as covert approaches.

This user activated feature is available on the T10 through use of the selector switch. It is referred to by the manufacturer as ‘stealth mode’.

Data transfer and auditing

All CEDs have an in-built data recording facility. The capability and data parameters vary by device and are summarised in APP[16] as follows:

Data logging system

CEDs have an internal data logging system that, depending on the model, records various parameters of use. This can be summarised as follows.

Table 1, CED data download comparison

Model	Date/time											
	Operation of safety	Operation of trigger	Start of discharge	End of discharge	Operation of sub-systems	Time sync	Duration of discharge	Battery temperature	Battery condition	Pulse log	Engineering log	Number of recorded events (approx.)
X26	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	2000
X2	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	16000
T7	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	16000

[16] **Conducted energy devices (Taser) | College of Policing**

In addition, the X2 and T7 have pulse graphs available which give information on charge and other parameters that the device discharged.

According to the manufacturer the T10 adds additional data parameters that include date/time the device is removed from a compatible holster and distance from the device to the subject.

Axon explain, the device identifies the distance by measuring the time from the device firing to the time a circuit was completed. As the velocity of a T10 probe is known, it can compute the approximate distance.

Taser 10 settings

Certain features of the Taser 10, in common with existing devices, can be configured by the force/agency via Axon Evidence. They include (Axon's description provided, setting used for user handling trial in bold):

- *laser*
    - *Determines if an Armed TASER 10 uses a laser to identify approximate impact location of the probe. When set to "Motion Control", the laser automatically turns on when sudden movement from a "low ready" (e.g. "sul position")[17] to an aiming position is detected while Armed. Once the Laser is on, it shall remain so until the weapon returns to a "low ready" position or the weapon powers off. "Low ready" is defined as 90 +/- 30 degrees downward from a level plane. Aiming position is defined as 0 degrees +/- 30 degrees from a level plane.*
    - ***Always on***
    - *Always off*
    - *Motion control*
- *Flashlight*

[17] referred to as the 'ready' and 'south' positions in the UK

    - *Determines if TASER 10 provides a forward facing illumination.*
    - ***Enabled***
    - *Disabled*
- *warning alert flashlight strobe*
    - *Determines if a TASER 10's flashlight will strobe during the Warning Alert.*
    - ***Enabled***
    - *Disabled*
- *side lights*
    - *Determines if TASER 10 communicates weapon information to other officers and public using lights on the sides of the device. Lights are colored red for error, yellow for armed with a live duty magazine, and blue for armed with a HALT, inert or live training magazine.*
    - ***Enabled***
    - *Disabled*
- *Sounds*
    - *Determines if TASER 10 provides audible feedback and alerts to officer during operation. This does not affect the Warning Alert.*
    - ***Enabled***
    - *Disabled*
- *Stealth*
    - ***Enabled***
    - *Disabled*
- *default inventory status*
    - *Determines if Axon Evidence automatically sets the status of cartridges to In-Stock when cartridges are first registered. When disabled, the status of cartridges is set to None. Axon recommends enabling this*

setting only if your force manually updates the Status of every cartridge.

- *Enabled*
- ***Disabled***

- *automatic shut-down*
  - *When set to Hard Stop, TASER 10 automatically shuts-down electrical discharge after 5 seconds, regardless of the trigger or switch position. When set to Switch Override, the weapon continues electrical discharge after 5 seconds, as long as the switch is held up. When set to Disabled, the weapon continues electrical discharge after 5 seconds, as long as the switch is held up or the trigger is held in the pull position.*
  - *Enabled - Hard Stop*
  - ***Enabled - Switch Override***
  - *Disabled*

The settings chosen reflect current practice with existing devices as far as possible.

A new setting, related to the laser sight being disabled when the device is in a 'low ready' position is available. Whilst this may have some merits, there is a concern that it may inadvertently disable the laser when aiming at a subject in a low position. Such a risk may outweigh any benefits. For this reason, this feature was disabled. However, this potential risk has not been explored or tested.

Weather resistance

Axon state[18] the T10 is weather resistant to IP67 (ingress protection). This has improved from previous devices. The T7 is rated to IP53 and X2 IP52.

IP6X, relates to solid particle protection.

[18] **taser-10-product-card-1**

6	Dust-tight	No ingress of dust; complete protection against contact (dust-tight). A vacuum must be applied. Test duration of up to 8 hours based on airflow.

IPX7, relates to liquid ingress.

7	Immersion, up to 1 meter (3 ft 3 in) depth	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 meter (3 ft 3 in) of submersion).	Test duration: 30 minutes Tested with the lowest point of the enclosure 1,000 mm (39 in) below the surface of the water, or the highest point 150 mm (5.9 in) below the surface, whichever is deeper.

Axon have indicated that the rating applies when the Taser 10 is loaded with a full magazine. The weather resistance of a T10 with a partially emptied magazine is unknown.

User handling trial

As part of the assessment of the TASER 10™ (T10) conducted energy device (CED) a user handling trial, using a representative cohort of police officers, has been conducted. The outcome will support the level 3 (technical) evaluation of the device.

The cohort undertook a series of exercises designed to test the identified requirements. Other requirements are to be addressed via technical testing (level 3) manufacturer supplied information (level 1), and operator judgment panel conclusions (level 2).

The user handling exercises have been repeated using the Taser X2™ and Taser 7™ for comparison purposes. After completing the exercises, the users completed a questionnaire to capture their responses and comments in relation to the T10 and their existing device (where applicable).

This broadly follows the approach taken by the Home Office Centre for Applied Science and Technology (CAST) in their evaluation of the Taser X2[19] and Defence Science and Technology Laboratory's (Dstl) evaluation of Taser 7[20], as they relate to user testing.

Overview

The handling trial evaluates the following operational/system requirements:

Table 2, system requirements directly related to handling trial

OR2	SR3	A suitably trained officer should be able to hit a static person sized target with a minimum of two probes over the defined operational range.
OR3	SR4	In the event of failing to subdue the subject (or the subject breaking free) the system should be able to fire further probes without reloading to attempt incapacitation.
OR17	SR8	The system must be effective against a moving target within the operational range if the officer manages to obtain contact with the probes.
OR19	SR11	The system should be able to provide gradual escalation of force through a variety of means.

It has also provided data that may support the evaluation of:

Table 3, system requirements supported by handling trial

OR1	SR1	The device should have an effect against a subject at range.
OR21	SR10	The targeting system should be usable with either eye (dominant/non-dominant).
OR9	SR12	The system should be capable of being operated by an individual officer using either hand.
OR12	SR17	The system should temporarily neutralise the threat with reliability through NMI rendering the subject incapable of carrying out their intended action.
OR14	SR19	The system should not adversely affect or impair the user (officer) during use without any need for additional PPE.
OR18 OR22	SR29	The system should be reliable in use and function as expected when activated.

[19] CED Replacement Project, Assessment of the TASER X2™ against the Police Operational Requirements, CAST Publication No.057/16 https://www.gov.uk/government/publications/cast-assessment-of-the-taserx2

[20] Physical Assessment of TASER 7™, Dstl/TR117685 v1.0, 13 March 2020

OR18 OR22	SR30	The system should have a self-checking mechanism with integrated self-diagnostics to confirm that the system is working to specification with confirmation to the user.
OR23	SR31	The system should be usable and readily trainable with minimal infrastructure implications (simple and intuitive).

Comparison of accuracy data at 3m, 5m, 10m and 13.7m (45ft), and the rate of success in delivering two probes, allows assessment of the devices' ability to deliver 'an effect at range'. It also informs whether the 'threshold' value is met and practical maximum range of the device.

SR10 and SR12 are reflected in the demographics of the participants and this information has been recorded.

Exercise 7 (box drill, see page 54) is an operationally relevant dynamic exercise that provides success rate (two probes on target) and probe spread data that supports the evaluation of SR17.

SR19 has been considered by noting any such occurrences.

SR31 has been addressed by surveying competent Taser 10 instructors from the national practitioner group.

SR29/SR30 has been evaluated by recording, in as much detail as possible, any faults with the whole system that occurred during the user handling trial (see faults and observations below). Faults were categorised, on risk/consequence basis as if the fault had occurred in an operational setting, as follows:

Table 4, fault categorisation

Category	Description	Consequences
Cat A – Safety critical	A fault that was not identified during function checking procedures (i.e. the device could have been deployed operationally in this state.) that would have resulted	Failure of device to deploy. Could result in injuries to officer/subject/public. Could have implications ranging from minor to fatal.

	in an operational failure of the device.	
Cat B – Major fault	A fault of a subsystem that was not identified by the function testing process. Subsystems generally do not stop the device functioning but could compromise or limit its operation.	Although device could still operate and deploy, it may be compromised. Could result in loss of confidence of officers and public.
Cat C –Fault (identified)	A fault identified through function checking procedures.	Function checking (as per manufacturer's instructions) has achieved its purpose and eliminated a faulty device, battery or cartridge, resulting in removal from service. Excessive frequency of such faults could result in limiting availability of devices for operational deployment or training, and impact officer confidence.
Cat D –Fault (identified) cleared through trouble shooting.	An identified fault that has negligible impact on operational performance, cleared through 'trouble shooting'.	If this occurred during function checking, then little operational impact. If during an operational deployment (e.g. operational reload) then may compromise

		effectiveness and officer confidence.
Cat E – Minor fault identified	A minor fault or issue that has negligible impact on operational performance.	Negligible.

All Taser devices were subject to inspection by a technician competent in the maintenance and inspection of the system prior to the commencement of the trial.

The T10 devices were supplied to the College by Axon for the purposes of the trial. Whilst they were used for some training prior to the trial, they were otherwise ‘as new’. The X2 and T7 devices were supplied by Gwent Police and the College from their training stock.

Each device was function checked by the participant in accordance with manufacturer’s instructions and relevant curriculum at the start of each exercise.

The CED and battery serial number were recorded for each participant. The battery percentage was recorded at the start and end of the trial, both from the information on the central information display and from the download.

Each T10, battery and magazine was allocated a number for the purposes of the handling trial and allocated to a specific individual. (Devices being T1 to T22, batteries B1 to B22 and magazines M1 to M22)

Figure 23, Sixteen of the 22 T10 devices prior to allocation

A second battery was provided for the training phase to ensure each device started the trial with a freshly charged battery.

User handling trial exercises

To evaluate the systems' performance, as they relate to the identified system requirements, a series of seven exercises were designed by the College in consultation with partner agencies, including NPCC and Dstl. The seven exercises (numbered 1 to 7) were designed to offer comparative data on the T10, T7 and X2 devices. This allowed further analysis of whether system requirements were indeed met.

Four additional exercises (numbered 2A, 2B, 3A and 3B) were designed specifically to explore the increased range of the T10 (up to 45ft/13.7m), which is beyond the range of extant devices (up to 25ft/7.6m).

The exercises are summarised in table 5 below.

Table 5, handling trial exercises

Exercise No.	Distance	Position of officer	Target type/position	Description	Sights	No. of shots, bays	Number of times conducted	Cartridge type	Comments OR/SRD ref	Measurable parameters
Unique reference number	Distance from device to target	Firing position as per NPFTC	Description of target type and position	Description of exercise to be conducted	Type of sight to be used	Number of shots/probe pairs	The total number of times exercise conducted	T7 cartridge in ()		
1	3m	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Laser	One	3	Live (T7-CQ)	OR2/SR3	Distance from POA to POI
	Exercise 1 is intended to assess basic practical accuracy at a commonly encountered distance using a standard two-handed grip. Analysis of data from this exercise, against that from technical testing, allows comparison of the intrinsic accuracy and practical accuracy of the system. It also builds participant experience of the system to inform questionnaire responses. Comparison of T10 data with that of extant systems can also be made. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
2	5m	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate	Laser	One	3	Live (T7-SO)	OR2/SR3	Distance from POA to POI

				probe spread						
	Exercise 2 is identical to exercise 1 but at an increased range of 5m. Similar comparisons can be made along with accuracy at 5m vs 3m. It also builds participant experience of the system to inform questionnaire responses. Comparison of T10 data with that of extant systems can also be made. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
2A	10m	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Laser	One	3	Live	T10 only OR2/SR3	Distance from POA to POI
	Exercise 2A is beyond the range of extant systems but within the range of the T10. Data from this exercise should establish the practical accuracy and utility of the device towards the upper end of its claimed range. It also builds participant experience of the system to inform questionnaire responses. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
2B	13.7m (45ft)	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Laser	One	3	Live	T10 only OR2/SR3	Distance from POA to POI

	Exercise 2B is at the maximum range indicated by the manufacturer. Data from this exercise should establish the practical accuracy and utility of the device at the upper end of its claimed range. It also builds participant experience of the system to inform questionnaire responses. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
3	5m	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Fixed (stealth mode)	One	3	Live (T7-SO)	OR2/SR3	Distance from POA to POI
	Exercise 3 is essentially a repeat of exercise 2 but using the fixed sights instead of the laser sight. Comparison of exercise 2 vs 3 should allow comparison of both the practical accuracy and utility of both sighting systems. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
3A	10m	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Fixed (stealth mode)	One	3	Live	T10 only OR2/SR3	Distance from POA to POI
	Exercise 3A is essentially a repeat of exercise 2A but using the fixed sights instead of the laser sight. Comparison of exercise 2A vs 3A should allow comparison of both the practical accuracy and utility of both sighting systems.									

	In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
3B	13.7m (45ft)	Standing on aim, two handed grip	Accuracy target	At fixed aiming mark/line, achieving adequate probe spread	Fixed (stealth mode)	One	3	Live	T10 only OR2/SR3	Distance from POA to POI
	Exercise 3B is essentially a repeat of exercise 2B but using the fixed sights instead of the laser sight. Comparison of exercise 2B vs 3B should allow comparison of both the practical accuracy and utility of both sighting systems at the maximum range indicated by the manufacturer. In the interests of expediency, attempt one should be fired on the green, two on yellow and three on red. This will allow differentiation of data.									
4	3m	Standing ready, two handed grip	Accuracy target	Achieve adequate probe spread	Laser	One	3	Live (T7-SO)	OR2/SR3	Distance from POA to POI
	Exercise 4 considers the devices' performance when aimed and fired at a subject in an unconventional supine posture (horizontally presented target). It should assist in examining whether the T10 has greater utility in this regard, as it is not necessary to orientate the device with the subject in the same manner as extant systems. Aiming at upper green, upper red (right-handed officers) or upper red, upper green (left-handed officers).									

5	3m	Standing ready, two handed grip	Accuracy target	Arc display. Fire two probe pairs, extend, cease and re-energise. Achieve adequate probe spread	Laser	Three	3	Live (T7-CQ)	T7/X2 will include reload OR2/SR3 OR3/SR4 OR19/SR11 SR5	Distance from POA to POI and probe spread Time to complete
	Exercise 5 examines the device in delivering further probes should the first attempts fail. Probe location data and probe spread should assist in identifying likely NMI effects. The examination of the time taken to complete the exercise should offer an insight into the speed and utility of the system in comparison to extant systems. (Time commences on command engage (order to fire), finishes when probes delivered. T10 time of third and fourth probe to be recorded). (Examination of subsequent device event logs for accuracy against this exercise will inform SR5.)									
6	15m to 3m	Standing, holstered	Subject in HALT suit, advancing	Subject advances from 12m to 3m, officer to perform warning display and then fire when they can achieve	Laser	One	3	HALT (T7-CQ, SO available)	T7 may opt to reload OR2/SR3 OR19/SR11	Zone of subject in HALT suit, distance to subject when probes deployed. Probe spread.

				probe placement. When cycle finishes subject to stand up and officer to reenergise.						
	All CED systems will have a maximum effective range, which may be less than the maximum theoretical range. In an operational context officers will have to estimate whether a subject is within the effective range. Greater distance often assists in de-escalation and reducing risk to both the public, officer and subject. This exercise considers the maximum effective range and the systems accuracy and utility at this distance.									
7	Variable	Standing holstered	Subject(s) in HALT suit, advancing	Box drill	Laser	One per exposure	NA	HALT (T7-CQ, SO available)	OR2/SR3 OR17/SR18 OR19/SR11	Zone of subject in HALT suit, distance probes deployed. Probe spread.
	A ‘box drill’ is a common training technique where an officer is in the centre of a room/box with four open corners. They are confronted by a subject in a HALT suit from an unknown corner and expected to deal with the threat/no threat. They are essentially rapid ‘mini-scenarios’ that assist in simulating real world stressors, that could include all requisite									

	skills (laser dotting, arcing, firing, reassessing, re-energising follow up shots etc. This exercise would build significant participant experience of the system to inform questionnaire responses and assess the devices utility when subject to operationally relevant stressors. Order to be randomised. 1. Subject carrying bag across chest/torso, holding knife. First probe pair ineffective. (obstructed subject, further probe deployment) 2. Subject with hammer chasing victim, corner to corner. (moving subject) 3. Subject with bottle moving side to side, subject to get back up (moving subject, reenergise) 4. Subject with machete. Slashing at wires. First probe pair ineffective. (further probe deployment) 5. Subject with hammer and bin lid and moving. (obstructed subject) 6. Subject with knife, threatening self-harm, quickly crouch. (warning display, probe deployment unconventional posture)

Target design and data recording

Given the novel nature of the T10, where single probes are fired independently, a bespoke target was designed for the trial that allowed multiple aiming points.

The target board had six circles, 150mm in diameter with a contrasting 20mm centred aiming point. This was overlayed with a 1cm grid pattern. Each circle was 500mm apart in the vertical plane and 200mm in horizontal plane (centre to centre).

Each exercise directed where the officer should aim. For the T10 this was two different circles, e.g. upper green, lower green. For the T7/X2 this was a circle and an axis, e.g. upper green, lower probe on the vertical axis.

The x and y coordinates of each probe were recorded and plotted from the primary aiming point.

This was measured from the relevant axis by tape measure to the nearest 0.5cm, using a centre

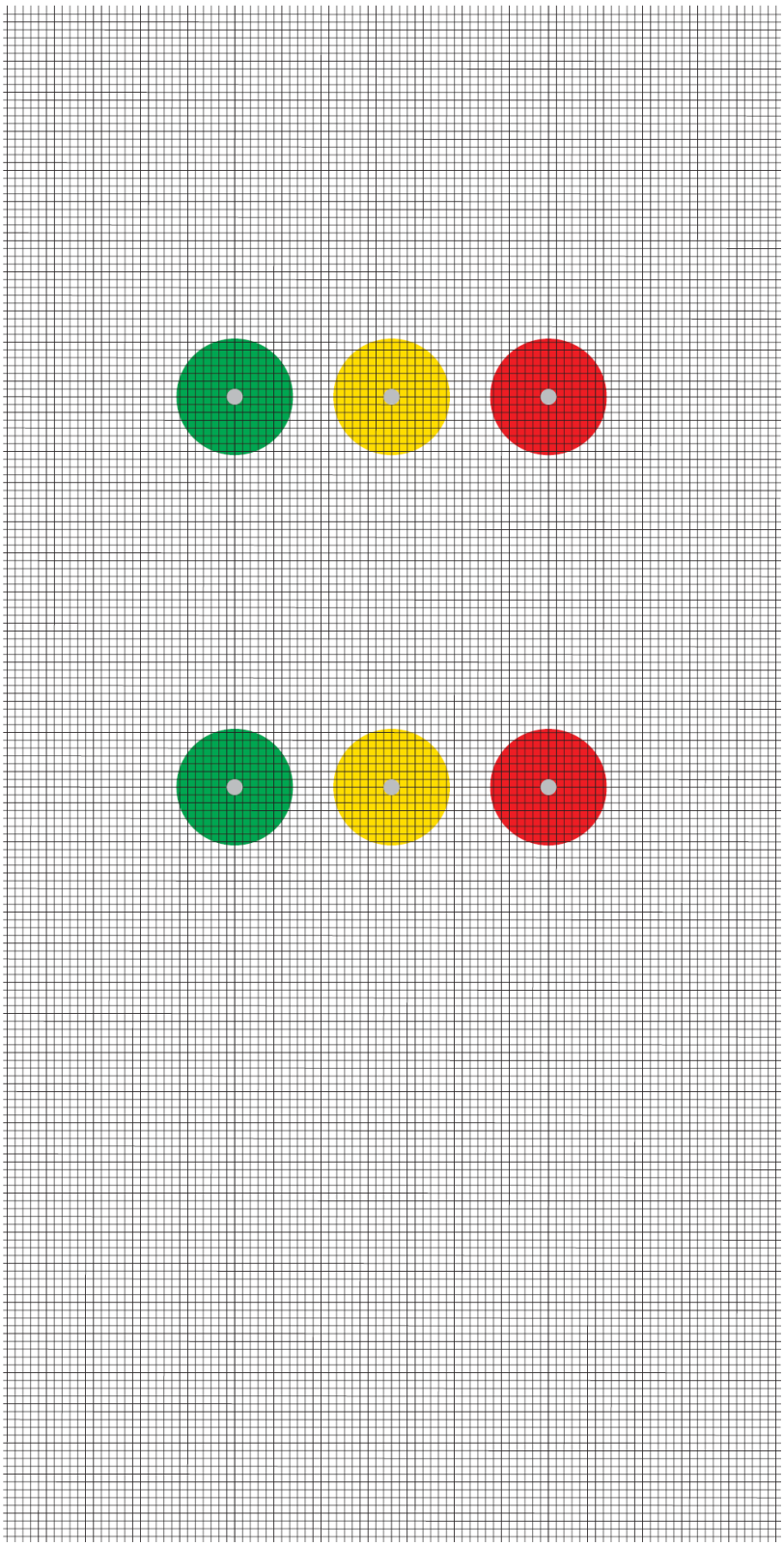


Figure 24, accuracy target design

gauging method (i.e. measuring to the centre of the probe).

Each exercise had a specific distance from which it was undertaken, this being the distance from the device to the target. The distance was measured using a laser measuring device and the distance marked on the floor.

Where time data was required, this was captured by an observer with a stopwatch.

Exercises 6 and 7 required engaging a role actor in a HALT suit. Probe locations were recorded by zone as per figure 25, with a miss ‘location’ represented by an M prefix.

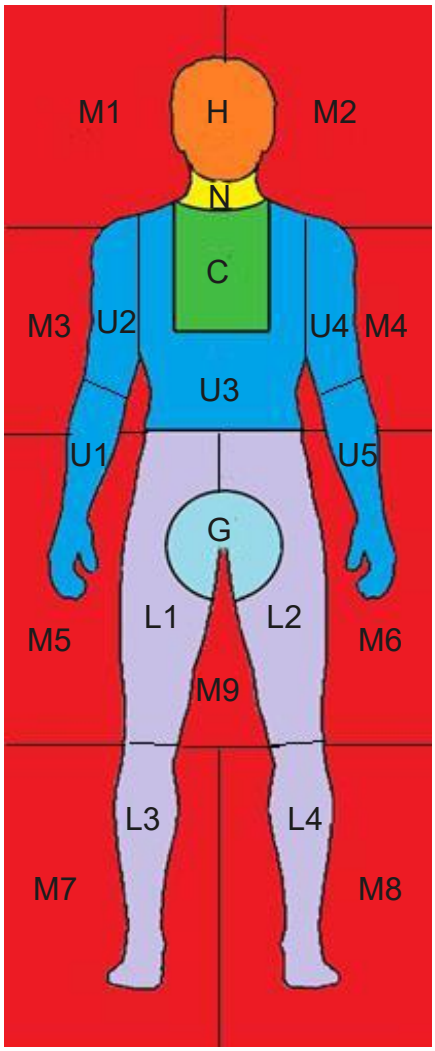


Figure 25, zoning for exercises 6 and 7

User handling trial 1 – results

A number of reliability issues were found during the first user handling trial (UHT1) which necessitated the conduct of a second trial (UHT2 – page 117) which, in turn, necessitated a third trial (UHT3 – page 141).

UHT1 was conducted on two separate occasions. The first week (commencing 09/10/2023) was at the Gwent Police Taser training facility (participants 1 to 11) and (commencing 23/10/23) Humberside Police's facility (participants 12 to 27).

Data was captured as previously described and is summarised, and an analysis offered, below.

Participant information summary

The cohort of officers was from nine different police forces and agencies:

- Derbyshire Constabulary
- Gwent Police
- Humberside Police
- National Crime Agency
- Northamptonshire Police
- Northumbria Police
- North Wales Police
- Thames Valley Police
- West Yorkshire Police

The group was as diverse as possible, from the officers made available, both in relation to individual characteristics and professional experience. They were typical of potential end users for the T10 system.

All participants voluntarily undertook the handling trial.

The cohort of 27 included officers from both covert and overt roles and split between armed and unarmed policing roles. The cohort reflected relevant personal characteristics as far as reasonably practicable.

With the exception of new users, each officer undertook the exercises with both the T10 and the device they are currently trained in.

Each participant was identified by a number (1 to 27) and their personal characteristics and results recorded against this number.

In summary the 27 participants consisted of:

- 18 men 9 women
- 10 X2 users, 9 T7 users and 8 new users
- Role profiles:
    - STO 9
    - Surveillance 3
    - ARV 2
    - CTSFO 3 (also competent in covert roles)
    - Armed surveillance 1
    - Police staff trainer 1
    - New users 8

Of note is 33% of the participants were women. According to Home office data[21], as of March 2023, 34.7% of police officers are women.

In relation to dominant hand and eye, the cohort consisted of the following:

- Right-handed, right dominant eye 18
- Right-handed, left dominant eye 7
- Left-handed, left dominant eye 2
- Left-handed, right dominant eye 0

[21] **Police workforce, England and Wales: 31 March 2023 - GOV.UK (www.gov.uk)**

It is broadly accepted that left-handed people make up approximately 10% of the population.

They varied in age from 28 to 55 years old.

The tallest officer was 199cm and the shortest 160cm.
Length of service also varied from less than four years to over 15, as did Taser experience varying from none (new users) to over 15 years.

Accuracy results

Accuracy is commonly considered as '*the difference between the point of aim (POA) and point of impact* (POI)'. There are two further sub-definitions the evaluation of the Taser 10 system should consider; '*intrinsic accuracy*'- the inherent accuracy of the weapon system (usually tested by firing from a clamp or jig) and '*practical accuracy*'- the accuracy in the hands of a competent user.

It is the practical accuracy this trial sets out to examine. The intrinsic accuracy is to be examined in further technical testing.

Accuracy data was gathered in nine of the 11 exercises for the T10 and five of the seven exercises for the X2 and T7 (the remaining four being beyond the maximum range of these devices).

The x and y coordinates of each probe were recorded as described on page 55. This allowed the distance from the POA to the POI to be calculated. Clearly the smaller the difference between POA and POI, the more accurate the system is.

Whilst each exercise is examined in more detail below, table 6 offers a summary of the mean radial distance from POA to POI for each system (T10, X2 and T7) and exercise. (Where POA is the centre of a circle, the radial distance being the radius from the centre of that circle to the POI. Allows comparison of accuracy irrespective of the direction. See figure 26). It also includes data filtered by each group; AFOs, STOs and new users, and contrasts accuracy data of the T10 with accuracy data of an officers' existing CED.

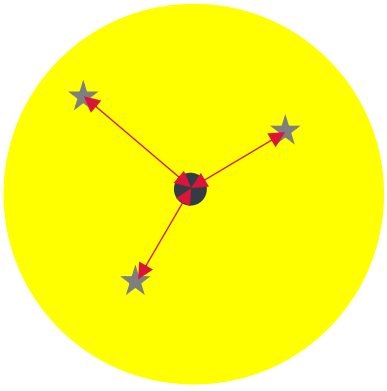


Figure 26, radial distance from POA to POI (illustrated by red lines)

Table 6, mean radial distance from POA to POI

Exercise	Distance	Sight	Mean radial distance POA to POI Most accurate shown in green, least accurate in red							
			T10 all users	T10 AFOs	T10 STOs	T10 new users	T10 X2 users	X2	T10 T7 users	T7
1 Top probe	3m	laser	2.9cm	3.2cm	**2.8cm**	3.1cm	3.0cm	3.8cm	2.8cm	**5.9cm**
2 top probe	5m	laser	4.4cm	4.8cm	**4.1cm**	4.7cm	3.8cm	10.5cm	4.9cm	**11.8cm**
3 top probe	5m	fixed	7.6cm	**5.3cm**	7.0cm	10.5cm	6.6cm	7.8cm	6.2cm	**9.5cm**
4 top probe	3m	laser	2.9cm	2.9cm	3.1cm	**2.5cm**	3.0cm	4.1cm	3.0cm	**7.3cm**
5 top probes	3m	laser	3.3cm	**3.2cm**	**3.2cm**	3.3cm	3.2cm	4.4cm	3.3cm	**6.3cm**
2A top probe	10m	laser	8.1cm	**7.1cm**	8.9cm	7.4cm	10.3cm	NA	6.2cm	NA
3A top probes	10m	fixed	14.5cm	**9.2cm**	14.5cm	18.6cm	14.0cm	NA	11.5cm	NA
2B top probe	13.7m	laser	12.3cm	**11.6cm**	13.0cm	12.0cm	15.5cm	NA	9.2cm	NA
3B top probe	13.7m	Fixed	17.3cm	**16.0cm**	17.2cm	18.4cm	16.8cm	NA	16.8cm	NA

As can be seen from the table above, when considering the mean radial distance from POA to POI, the T10 appears more accurate than both the X2 and T7 in every exercise. Indeed, when using the laser sight, the T10 appeared more accurate at 10m (8.1cm) than an X2 (10.5cm) and T7 (11.8cm) were at half that distance (5m).

(Note: no formal statistical analysis was undertaken)

The difference was less significant with the fixed sights, but it was still consistently better, the T10 being 7.6cm, the X2 7.8cm and 9.5cm at 5m.

The Taser 10 data was also 'filtered' by group characteristics. When the T10 data was examined for X2 users and T7 users, their mean accuracy with the T10 was better than that of their existing CED, despite having much more experience with their existing device.

Generally, T7 users appeared to perform marginally better with the T10 than X2 users. This may indicate that the results for the T7 are not compromised by a lesser skilled cohort. It can also be observed the T7 was the least accurate CED in all exercises.

For clarity, table 7 summarises the probe disposition by radial distance and shows the number (and percentage) of shots within defined radii of the POA for each exercise.

Table 7, T10 probe disposition by radial distance POA to POI

Exercise	Distance	Sight	Mean POA to POI	T10 probe disposition by radial distance POA to POI Percentage within parenthesis. (ex 1, 2 and 4 n=81, ex 3 n=80 ex 5 top n=234, ex 5 bottom n=232)*						
				<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1 (1st probe)	3m	laser	2.9cm	78 (96.3%)	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
1 (2nd probe)			2.8cm	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
2 (1st probe)	5m	laser	4.4cm	72 (88.9%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
2 (2nd probe)			4.4cm	74 (91.4%)	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
3 (1st probe)	5m	fixed	7.6cm	47 (58.8%)	62 (77.5%)	67 (83.8%)	73 (91.3%)	75 (93.8%)	77 (96.3%)	79 (98.8%)
3 (2nd probe)			4.6cm	68 (85.0%)	75 (93.8%)	80 (100%)	80 (100%)	80 (100%)	80 (100%)	80 (100%)
4 (1st probe)	3m	laser	2.9cm	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
4 (2nd probe)			2.6cm	79 (97.5%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)

5 (1st probe)	3m	laser	3.3cm	228 (97.4%)	233 (99.6%)	233 (99.6%)	234 (100%)	234 (100%)	234 (100%)	234 (100%)
5 (2nd probe)			3.3cm	227 (97.8%)	229 (98.7%)	231 (99.6%)	232 (100%)	232 (100%)	232 (100%)	232 (100%)
2A (1st probe)	10m	Laser	8.1cm	43 (53.1%)	58 (71.6%)	69 (85.2%)	72 (88.9%)	76 (93.8%)	78 (96.3%)	81 (100%)
2A (2nd probe)			8.8cm	46 (56.8%)	61 (75.3%)	66 (81.5%)	73 (90.1%)	78 (96.3%)	79 97.5%)	80 (98.8%)
3A (1st probe)	10m	Fixed	14.5cm	16 (20.0%)	31 (38.8%)	44 (55.0%)	50 (62.5%)	59 (73.8%)	63 (78.8%)	71 (88.8%)
3A (2nd probe)			8.5cm	39 (48.1%)	52 (64.2%)	68 (84.0%)	74 (91.4%)	78 (96.3%)	79 (97.5%)	80 (98.8%)
2B 1st probe	13.7m	Laser	12.3cm	19 (23.5%)	30 (37.0%)	46 (56.8%)	56 (69.1%)	63 (77.8%)	69 (85.2%)	79 (97.5%)
2B 2nd probe			13.0cm	15 (18.5%)	31 (38.3%)	41 (50.6%)	54 (66.7%)	63 (77.8%)	71 (96.3%)	78 (96.3%)
3B 1st probe	13.7m	Fixed	17.3cm	12 (15.2%)	16 (20.3%)	25 (31.6%)	33 (41.8%)	38 (48.1%)	49 (62.0%)	66 (83.5%)
3B 2nd probe			14.3cm	17 (21.8%)	25 (32.1%)	39 (50.0%)	47 (60.3%)	55 (70.5%)	61 (78.2%)	71 (91.0%)
***Where n is less than predicted number of shots, reflects no data following fault or technical issue.**										

The data in table 7 is discussed in more detail in the analysis of each exercise below.

Exercise 1 – practical accuracy at 3m

Exercise 1 was conducted at 3m, a commonly encountered distance for Taser users, from the standing position, using a two-handed grip with the laser sight.

Figure 27, officers at 3m during exercise 1

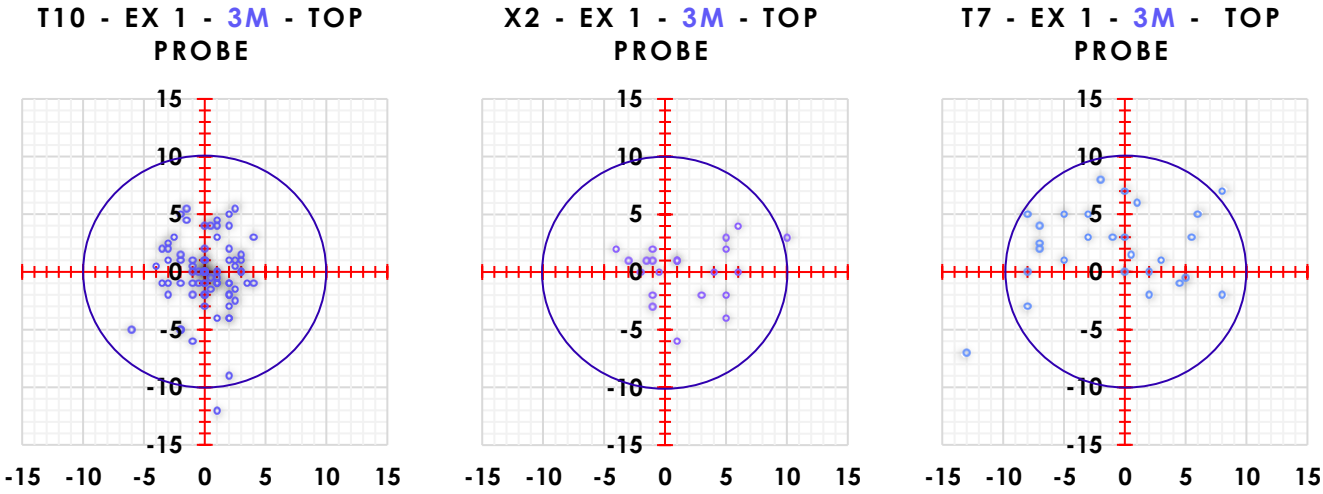
The mean radial distance from POA to POI for the T10 was 29mm on the first shot and 28mm on the second (table 8, below). This compares to 38mm for the first shot with X2 and 59mm with the T7. Based on this analysis the Taser 10 was the most accurate device at 3m during exercise 1.

Table 8, exercise 1, probe disposition POA to POI

Probe disposition by radial distance POA to POI. **Percentage within parenthesis.**											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10	29mm	0mm	120mm	78 (96.3%)	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
2nd probe		28mm	0mm	76mm	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)

1st probe	X2	38mm	5mm	104mm	29 (96.7%)	29 (96.7%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)
2nd probe [22]		37mm	4mm	122mm	28 (93.3%)	28 (93.3%)	29 (96.7%)	29 (96.7%)	29 (96.7%)	29 (96.7%)	29 (96.7%)
1st probe	T7	59mm	0cm	148mm	18 (66.7%)	25 (92.6%)	26 (96.3%)	27 (100%)	27 (100%)	27 (100%)	27 (100%)
2nd probe [2324]		61mm	4mm	189mm	15 (71.4%)	19 (90.5%)	20 (95.2%)	20 (95.2%)	20 (95.2%)	21 (100%)	21 (100%)

The probe dispersion can be compared in the graphs below (see graph 1, axis scales in cm) for each system. A circle (100mm radius) has been added to aid comparison. It can be seen the shots appear centred on the point of aim (0,0) and show no apparent bias in either axis.



Graph 1, exercise 1, probe dispersion at 3m T10, X2 and T7 (laser sight)

[22] Predicted POA, 37.6cm below main POA. (Based on CAST technical evaluation)
[23] Predicted POA, 70.4cm below main POA. (Based on Dstl technical evaluation)
[24] Data recording error on six shots. Excluded from dataset. n=21

Exercise 2 – practical accuracy at 5m

Exercise 2 is essentially the same as exercise 1 but at an increased range of 5m.

It should also be noted that officers are only currently summatively assessed during the qualification shoot at a maximum range of 4m[25]. However, 5m is within the maximum range of all three devices.

Consistent with exercise 1, the T10 was the most accurate device, mean POA to POI measuring 44mm on both the first and second shots. This compared to 105mm for the X2 and 114mm for the T7 top probes. So, whilst the X2 and T7 appear broadly consistent with one another, the T10 appears to be markedly more accurate. Indeed, the T10 was more accurate at 5m (44mm) than the T7 (61mm) at 3m and comparable with the X2 (39mm) at this distance.

Table 9, exercise 2, probe disposition POA to POI

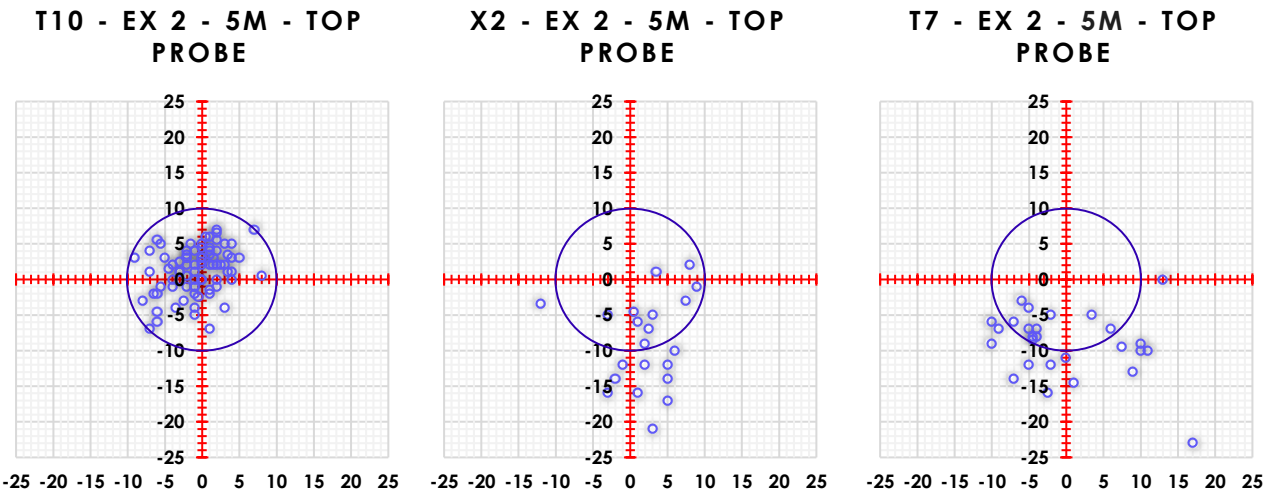
Probe disposition by radial distance POA to POI. Percentage within parenthesis.											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10	44mm	0mm	99mm	72 (88.9%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
2nd probe	T10	44mm	0mm	100mm	74 (91.4%)	80 (98.8%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)	81 (100%)
1st probe	X2	105mm	28mm	212mm	9 (30%)	15 (50%)	20 (66.7%)	24 (80%)	26 (86.7%)	29 (96.7%)	30 (100%)
2nd probe[26]	X2	127mm	12mm	283mm	12 (44.4%)	18 (66.7%)	22 (81.5%)	23 (85.2%)	24 (88.9%)	25 (92.6%)	25 (92.6%)
1st probe	T7	114mm	54mm	286mm	4 (14.8%)	11 (40.7%)	16 (59.3%)	23 (85.2%)	26 (96.3%)	26 (96.3%)	26 (96.3%)

[25] X2 Qualification Shoot V6.0, T7 Qualification Shoot V6.0, detail 4
[26] Based on predicted POA, 63.26cm below main POA. (Based on CAST data at 4.6m (58.2cm or 12.65cm /m, =63.26cm @5m))

2nd probe [27]		88mm	6mm	173mm	13 (48.1%)	16 (59.3%)	22 (81.5%)	24 (88.9%)	27 (100%)	27 (100%)	27 (100%)

Interestingly, at 5m, 88.9% T10 of first/top probes were less than 75mm from point of aim, whereas for the X2 this was only 30% and for T7 14.8%. This would indicate the T10 is consistently more accurate and has lower probe dispersion than the X2 and T7 with the laser sight at 5m.

The shot fall pattern in graph 2 below shows a consistent centred pattern for the T10. Both the X2 and T7 the POI is generally lower than POA with greater dispersion.



Graph 2, exercise 2, probe dispersion at 5m T10, X2 and T7 (laser sight)

The low shot fall of the X2 and T7, in comparison to T10, is likely to be as result of the differences in velocity and kinetic energy of the probe. The T10's increased velocity and kinetic energy resulting in a 'flatter' trajectory.

Key finding 1

Key finding

The Taser 10 is more accurate, and has lower probe dispersion, than extant CEDs at 3 to 5m with the laser sight. This may be as result of improved

[27] Based on predicted POA, 47.39cm below main POA. (Based on Dstl data at 4.6m (43.6cm or 9.48cm /m, =47.39cm @5m))

intrinsic accuracy but also assisted by the relatively low complexity of aiming one probe at a time.

Exercise 2A – practical accuracy at 10m (T10 only)

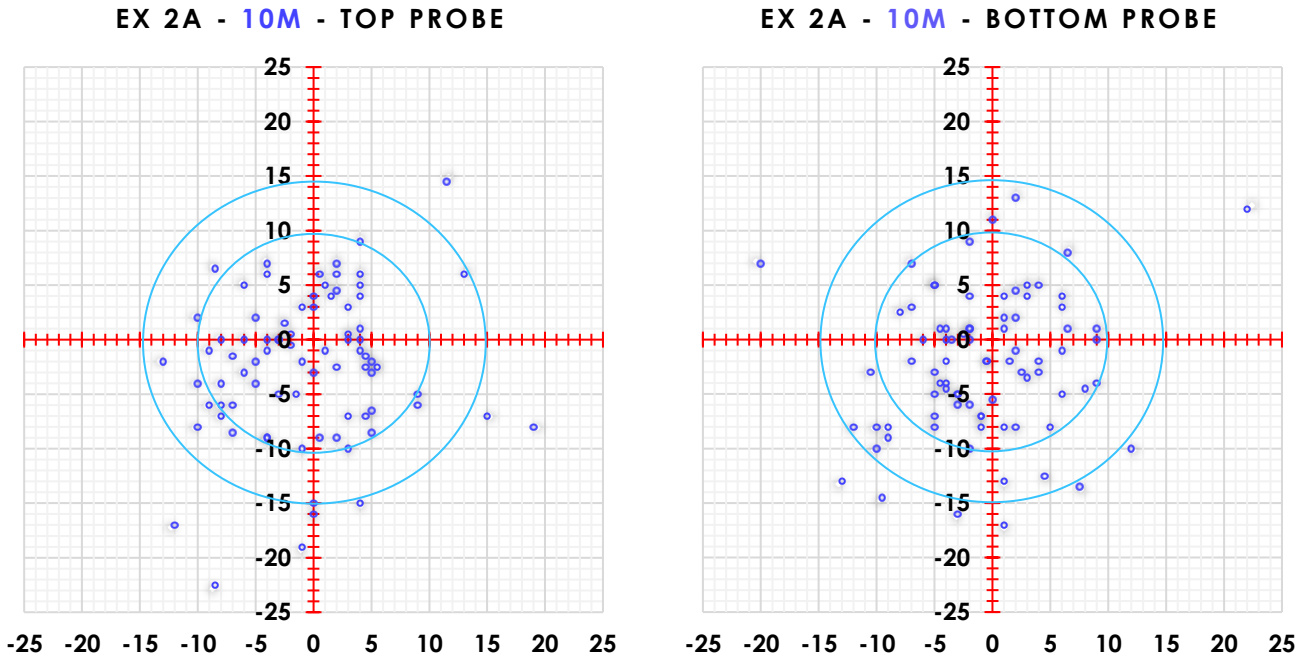
Exercise 2A is similar to exercise 1 and 2 but at a greatly increased distance of 10m (32.8ft), close to Axon's claimed 'zero' distance of 33ft.

Figure 28, officer at 10m during exercise 2A

This range is beyond the maximum range of the X2 and T7.

On average the radial distance from POA to POI was 81mm. However, this metric varied amongst users, the closest being 14mm, the furthest 241mm. Considering the officers' three attempts at this exercise, 23 out of 27 officers managed to get at least one of their first shots within 75mm of POA at 10m. Only one officer failed to get at least one probe within 75mm on the second shot.

Considering probe dispersion (see graph 3 below, concentric circles, radii of 100mm and 150mm, have been added to aid comparison). Generally, the shots show no distinct horizontal or vertical bias. However, not unsurprisingly, the probe dispersion has increased compared to shorter firing ranges, such as those at 3m (exercise 1) and 5m (exercise 2).



Graph 3, exercise 2A, probe dispersion at 10m T10 (laser sight)

Further analysis can be offered in considering the distribution of shots within specified distances of POA.

Table 10, exercise 2A T10 at 10m, probe disposition

Exercise	Distance	Sight	Mean POA to POI	Number of shots within specified distance of POA Percentage of overall within parenthesis. (n=81)						
				<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
2A Top probe	10m	Laser	81mm	43 (53.1%)	58 (71.6%)	69 (85.2%)	72 (88.9%)	76 (93.8%)	78 (96.3%)	81 (100%)
2A Bottom probe			88mm	46 (56.8%)	61 (75.3%)	66 (81.5%)	73 (90.1%)	78 (96.3%)	79 (97.5%)	80 (98.8%)

Table 10 shows that at 10m 53.1% of probes were within 75mm on the first shot, and 56.8% on the second.

Should the information in table 10 be ‘modelled’ on to a human form, one could postulate that high success rates could be expected depending where on the body an officer aimed. For example, accuracy within the sub 100mm range may be

sufficient for an accurate shot to the upper thigh, sub 150mm being sufficient for the lower torso. Based on this, indicative success rates would be 88.9% if the first shot was to lower torso, 75.3% if the second shot was to the upper thigh.

As previously discussed, 10m is beyond the maximum range of both the X2 and T7, however a comparison could be made of the accuracy of the T10 10m with the accuracy of the X2 and T7 at 5m, the longest range they were tested at.

As can be seen from table 12, on average the T10 proved more accurate and consistent at 10m than both X2 and T7 were at half that distance.

Table 11, exercise 2A T10 10m vs exercise 2 X2 and T7 5m

Probe disposition by radial distance POA to POI. Percentage within parenthesis.											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10 10m	81mm	14mm	241mm	43 (53.1%)	58 (71.6%)	69 (85.2%)	72 (88.9%)	76 (93.8%)	78 (96.3%)	81 (100%)
2nd probe	T10 10m	80mm	14mm	251mm	46 (56.8%)	61 (75.3%)	66 (81.5%)	73 (90.1%)	78 (96.3%)	79 (97.5%)	80 (98.8%)
1st probe	X2 5m	105mm	28mm	212mm	9 (30%)	15 (50%)	20 (66.7%)	24 (80%)	26 (86.7%)	29 (96.7%)	30 (100%)
2nd probe [28]	X2 5m	127mm	12mm	283mm	12 (44.4%)	18 (66.7%)	22 (81.5%)	23 (85.2%)	24 (88.9%)	25 (92.6%)	25 (92.6%)
1st probe	T7 5m	114mm	54mm	286mm	4 (14.8%)	11 (40.7%)	16 (59.3%)	23 (85.2%)	26 (96.3%)	26 (96.3%)	26 (96.3%)
2nd probe [29]	T7 5m	88mm	6mm	173mm	13 (48.1%)	16 (59.3%)	22 (81.5%)	24 (88.9%)	27 (100%)	27 (100%)	27 (100%)

[28] Based on predicted POA, 63.26cm below main POA. (Based on CAST data at 4.6m (58.2cm or 12.65cm /m, =63.26cm @5m))
[29] Based on predicted POA, 47.39cm below main POA. (Based on Dstl data at 4.6m (43.6cm or 9.48cm /m, =47.39cm @5m))

Key finding 2

Key finding

Notwithstanding other factors, such as thick clothing, it is reasonable to conclude that a Taser 10 has sufficient practical accuracy to be used at distances up to 10m with the laser sight. Being able to operate a CED from further away has several benefits, including the ability to give a subject more 'space' to aid de-escalation and, where deployed alongside firearms, reduce the likelihood of resorting to conventional firearms where extant CEDs would be outside their effective range.

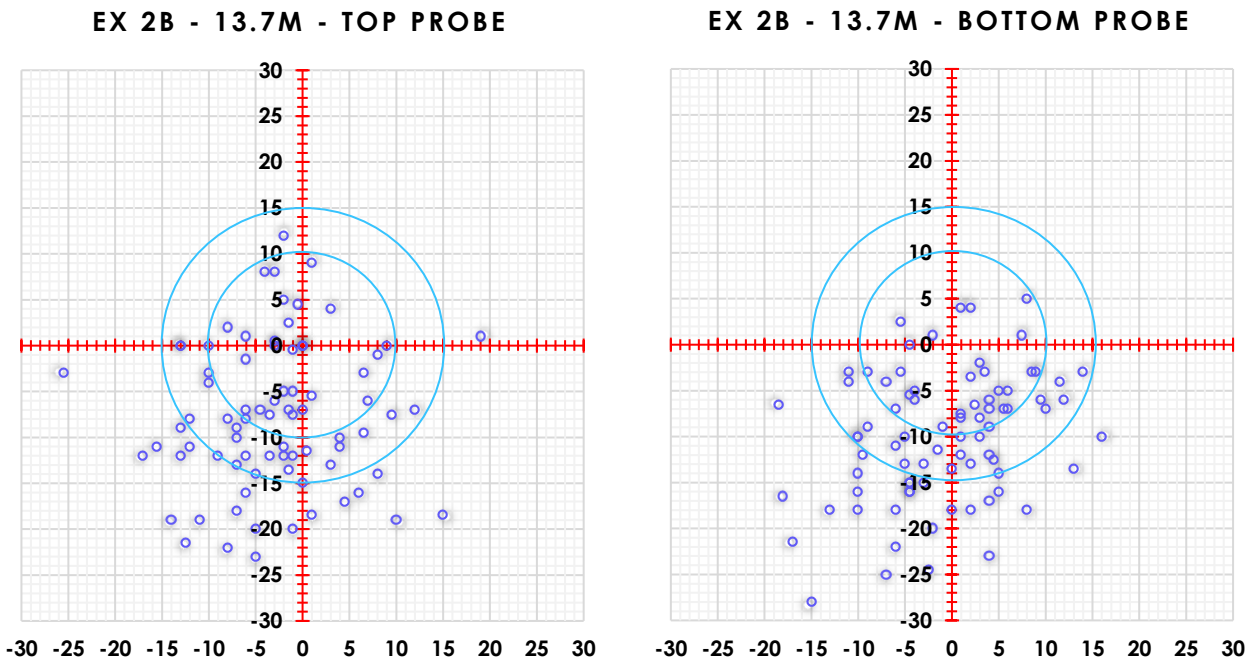
In addition, the T10, on average, was more accurate and consistent at 10m than both the X2 and T7 were at half that distance.

Exercise 2B – practical accuracy at maximum range (T10 only)

Essentially exercise 2B is the same as 2A etc. but at the maximum range of 13.7m.

Figure 29, officer at 13.7m during exercise 2B

The mean radial distance from the POA to POI was 123mm, first shot and 130mm for the second. This metric varied amongst users, the closest being 0mm, the furthest 330mm.



Graph 4, exercise 2B, probe dispersion at 13.7m T10 (laser sight)

Further analysis can be offered in considering the distribution of shots within specified distances of POA.

Table 12, T10 at 13.7m, probe disposition

Exercise	Distance	Sight	Mean POA to POI	Number of shots within specified distance of POA Percentage of overall within parenthesis. (n=81)						
				<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
2B first probe	13.7m	Laser	123mm	19 (23.5%)	30 (37.0%)	46 (56.1%)	56 (69.1%)	63 (77.8%)	69 (85.2%)	79 97.5%)
2B second probe			130mm	15 (18.5%)	31 (38.3%)	41 (50.6%)	54 (66.7%)	63 (77.8%)	71 (87.7%)	78 (96.3%)

Considering the parameters offered above of sub 100mm for probe placement in the leg and sub 150mm for the lower torso, whilst the device in the hands of proficient user can still be accurate at the upper range of 13.7m, the success rates drop off noticeably. At 13.7m, based on the definition offered above, only 37.0-38.3% of leg shots would have been successful and 66.7-69.1% of shots to the lower torso. This compares to 71.6-75.3% (leg) and 88.9-90.1% (lower torso) at 10m. One should also consider ‘less accurate shots’ have a greater likelihood of hitting a sensitive area such as the face, neck or groin. However, of note most shots are tending to go low, which may not mean they miss the subject rather they impact lower than the point of aim.

Exercise 3 – practical accuracy at 5m fixed sights

Exercise 3 is identical to exercise 2 but with the fixed sight employed rather than the laser.

It should be noted this was achieved in 'stealth mode' for all three devices. The T10 in stealth mode reverts to laser sights once the first shot has been fired, presumably as the need for 'stealth' is somewhat redundant after the first shot. For this reason, only the first shot/top probe is considered in relation to the accuracy of the fixed sights.

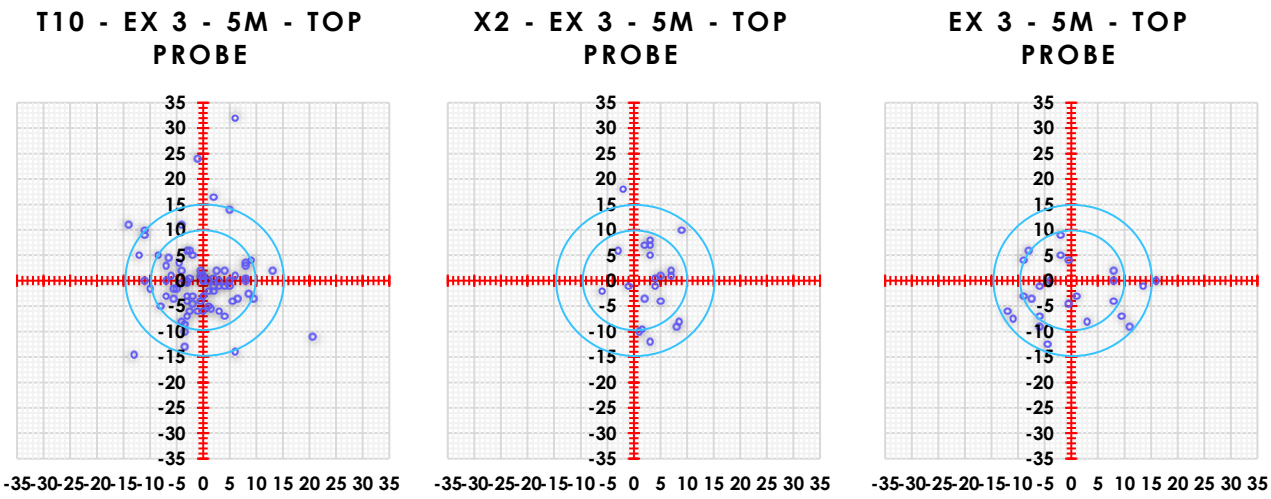
The average distance from POA to POI for the T10 was 76mm. This compared to the X2 76mm and T7 92mm

Table 13, mean POA to POI, comparison of laser vs fixed sights at 5m

	T10	X2	T7
			
Fixed sights	76mm	76mm	92m
Laser sights	44mm	105mm	118mm

Table 14, exercise 3, fixed sights probe disposition

Probe disposition by radial distance POA to POI. Percentage within parenthesis.											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10	76mm	0mm	326mm	47 (58.8%)	62 (77.5%)	67 (83.8%)	73 (91.3%)	75 (93.8%)	77 (96.3%)	79 (98.8%)
1st probe	X2	76mm	14mm	181mm	18 (60.0%)	23 (76.7%)	28 (93.3%)	29 (96.7%)	29 (96.7%)	30 (100%)	30 (100%)
1st probe	T7	92mm	32mm	172mm	7 (25.9%)	16 (59.3%)	20 (74.1%)	25 (92.6%)	27 (100%)	27 (100%)	27 (100%)



Graph 5, exercise 3, probe dispersion at 5m T10, X2 and T7 (fixed sights)

Whilst at first appearance the performance of T10 seems comparable with the X2, it should be remembered the T10 cohort consisted of eight new users, whilst the X2 and T7 group only featured current and competent users. One could contend that fixed sights require more practice and experience than laser sights.

In the T10 data set, considering the least accurate 10% (9) of shots, six of them were produced by new users and three by more experienced users. So new users produced two thirds of least accurate shots yet were only approximately one third of the cohort.

To examine this point further, and offer a direct comparison, the T10 data for exercise 3 was filtered to only include X2 users so a more direct comparison can be made.

Table 15, exercise 3 comparison T10 and X2 (X2 users)

Probe disposition by radial distance POA to POI. Percentage within parenthesis.											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10	66mm	0mm	195mm	27 (90%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)	30 (100%)
1st probe	X2	76mm	14mm	181mm	18 (60.0%)	23 (76.7%)	28 (93.3%)	29 (96.7%)	29 (96.7%)	30 (100%)	30 (100%)

As can be seen from table 15 when the same group is compared, and new users and T7 users removed, the T10 appears to be more accurate and consistent than

the X2. A similar outcome can also be observed when the data is filtered for T7 users (table 16, below)

Table 16, exercise 3 comparison of T10 and T7 (T7 users)

Probe disposition by radial distance POA to POI. Percentage within parenthesis.											
Device		Mean	Min	Max	<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
1st probe	T10	62mm	1mm	233mm	21 (77.8%)	24 (88.9%)	25 (92.6%)	26 (96.3%)	26 (96.3%)	26 (96.3%)	27 (100%)
1st probe	T7	92mm	32mm	172mm	7 (25.9%)	16 (59.3%)	20 (74.1%)	25 (92.6%)	27 (100%)	27 (100%)	27 (100%)

Of note is the accuracy of both the X2 and T7 improved with the use of fixed sights in relation to the first/upper probe. One could speculate this may be for two principal reasons. Firstly, the relatively low complexity of only aiming one probe and not having to aim two lasers simultaneously. Secondly fixed sights demand more focussed concentration from the user; therefore, this may improve accuracy in relation to the upper probe. However, this is without regard to the accuracy of the lower probe which is only ‘aimed’ by the officer estimating its likely position.

Key finding 3

Key finding

Consistent with the findings in relation to the laser sight, the T10 again proved to be the most accurate device of the three with fixed sights at 5m.

Exercise 3A – practical accuracy at 10m fixed sights (T10 only)

Exercise 3A explored the accuracy of the fixed sights at 10m.

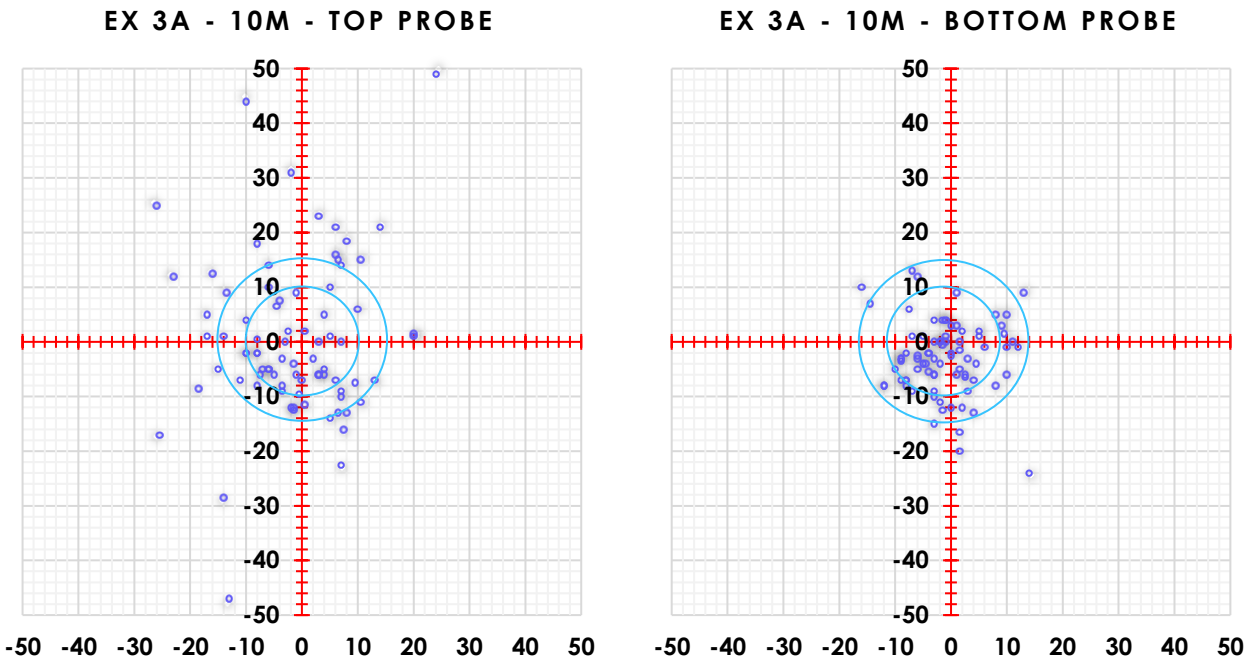
This is beyond the range of the X2 and T7 therefore a comparison is not offered.

The average distance from POA to POI was 145mm, this compares to 81mm when using the laser sight.

Table 17, comparison of laser vs fixed sights at 10m

Exercise	Distance	Sight	Mean POA to POI	Number of shots within specified distance of POA Percentage of overall within parenthesis. (n=81)						
				<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
3A first probe	10m	Fixed	145mm	16 (19.8%)	31 (38.3%)	44 (54.3%)	50 (61.7%)	59 (72.8%)	63 (77.8%)	71 (87.7%)
3A second probe	10m	Laser	85mm	39 (48.1%)	52 (64.2%)	68 (84%)	74 (91.4%)	78 (96.3%)	79 (97.5%)	80 (98.8%)
2A first probe	10m	Laser	81mm	43 (53.1%)	58 (71.6%)	69 (85.2%)	72 (88.9%)	76 (93.8%)	78 (96.3%)	81 (100%)

Of note the most accurate shot during this exercise was 21mm POA to POI, the least accurate was 546mm. Noting the device reverts to laser sights after the first probe is fired it should be remembered the second (lower) probe is fired using the laser sight.



Graph 6, exercise 3A, probe dispersion at 10m T10 (top probe with fixed sight, bottom probe with laser sight)

When comparing first shots, the accuracy of the T10 was significantly better at 10m when using the laser sight. (See graph 6).

During exercise 2A indicative success rates would be 88.9% if the first shot was to lower torso, 75.3% if the second shot was to the upper thigh (lower torso being sub 150mm, leg being sub 100mm). By using the fixed sights, during exercise 3A, this reduced to 61.7% for the torso and 64.2% for the leg.

Key finding 4

Key finding

In the hands of a proficient user using the fixed sight, the device remains accurate at 10m, although greater accuracy would be achieved using the laser sight.

Exercise 3B – practical accuracy at maximum range fixed sights (T10 only)

Exercise 3B examined the accuracy of the fixed sights at the maximum theoretical range of the device 13.7m.

This is beyond the range of the X2 and T7 therefore a comparison is not offered.

The mean radial distance from POA to POI was 173mm, this compares to 123mm when using the laser sight.

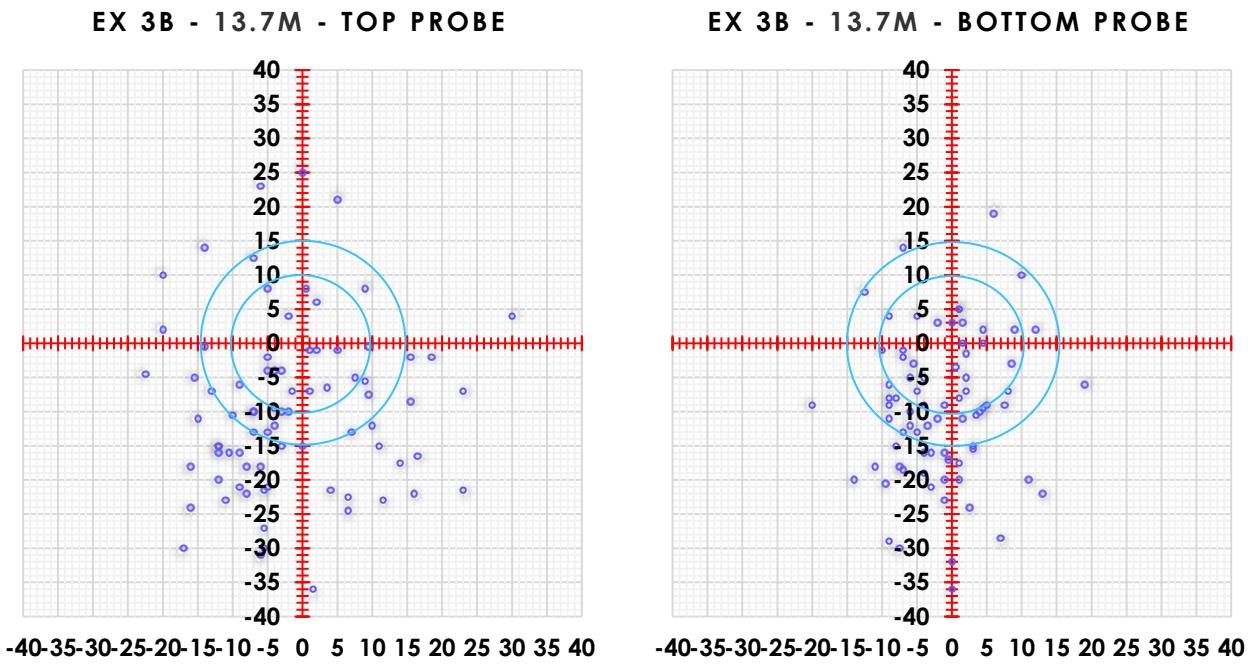
Table 18, comparison of laser vs fixed sights at 13.7m

Exercise	Distance	Sight	Mean POA to POI	Number of shots within specified distance of POA Percentage of overall within parenthesis. (3B n=79, 2B n=81)						
				<75mm	<100mm	<125mm	<150mm	<175mm	<200mm	<250mm
3B first probe	13.7m	Fixed	173mm	12 (14.8%)	16 (19.8%)	25 (30.9%)	33 (40.7%)	38 (46.9%)	49 (60.5%)	66 (81.5%)
3B second probe	13.7m	Laser	143mm	17 (21.8%)	25 (32.1%)	39 (50%)	47 (60.3%)	55 (70.5%)	61 (78.2%)	71 (91%)
2B first probe	13.7m	Laser	123mm	19 (23.5%)	30 (37.0%)	46 (56.1%)	56 (69.1%)	63 (77.8%)	69 (85.2%)	79 97.5%)

The most accurate shot was within 14mm of POA, the least accurate 360mm.

Considering the parameters offered above of sub 100mm for probe placement in the leg and sub 150mm for the lower torso, whilst the device in the hands of proficient user can still be accurate at the upper range of 13.7m the success rates drop off noticeably. At 13.7m only 19.8% of leg shots would have been successful and 40.7% of shots to the lower torso. This compares to 37% (leg) and 69.1% (lower torso) at 13.7m with a laser sight.

Of note 30% of the cohort were new users. When considering the least accurate 10% (n=7) of shots, 72% were produced by new users and 18% produced by existing users. This suggests more experienced officers are more accurate at longer ranges than new users when using fixed sights.



Graph 7, exercise 3B, probe dispersion at 13.7m T10 (top probe with fixed sight, bottom probe with laser sight)

Noting the device reverts to laser sights after the first probe is fired it should be remembered the second (bottom) probe is fired using the laser sight when comparing the graphs above.

Key finding 5

Key finding

At the time of writing the intrinsic accuracy of the device has yet to be examined but based on these data it would appear the practical accuracy of the device at or near its maximum range (13.7m), with both sight systems, was more limited in comparison to 10m or less. However, accuracy was seen to improve when New Users were excluded from the analysis, suggesting the device remains accurate in the hands of proficient users.

Fixed sights summary

The laser sights are relatively simple in their utility, put simply the probe goes where the laser is pointed. Fixed sights are more complex, relatively speaking, as they require the user to correctly orientate the fore sight and rear sight with the target, all of which are in different focal planes. It is also necessary to close the non-dominant eye and aim with the dominant eye. These basic concepts in using fixed sights are included in all Taser and handgun training.

Figure 31, Taser 10 fixed sights, © AXON Inc.

Figure 30, Glock pistol fixed sights, © GLOCK Ges.m.b.H.

The form factor and fixed sights are broadly similar to that of a handgun (see figures 30 and 31). Therefore, one would expect officers trained in handguns (AFOs) to be more proficient given their increased experience and competence. These data appears to support this contention. As can be seen from table 19, AFOs were more accurate with fixed sights at all three distances (5m, 10m and 13.7m). Unsurprisingly the new users were the least accurate.

This supports the conclusion that training improves proficiency and therefore accuracy.

Table 19, accuracy of fixed sights by user group

Exercise	Distance	Sight	Mean distance POA to POI			
			T10 all users	T10 AFOs	T10 STOs	T10 new users
3 first probe	5m	fixed	7.6cm	**5.3cm**	7.0cm	10.5cm
3A top probes	10m	Fixed	14.5cm	**9.2cm**	14.5cm	18.6cm
3B top probe	13.7m	Fixed	17.3cm	**16.0cm**	17.2cm	18.4cm

Exercise 4 – practical accuracy at 3m supine subject

Exercise 4 considered the devices' performance when discharged at a subject in an unconventional supine posture (horizontally presented target). It should assist in examining whether the T10 has greater utility in this regard, as it is not necessary to orientate the device with the subject in the same manner as extant systems.

Officers discharged probes at lower green, lower red targets (right-handed officers) or lower red, lower green targets (left-handed officers). (see figure 32)

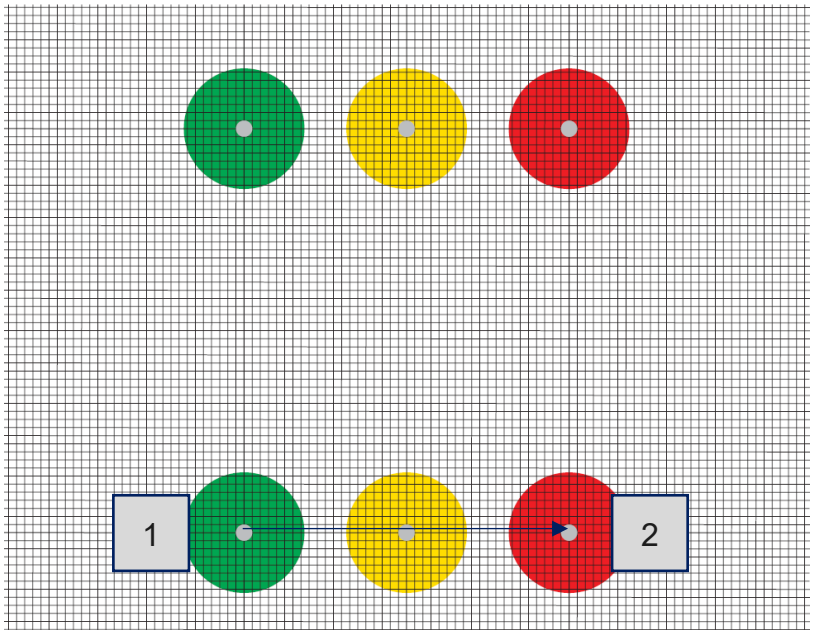


Figure 32, exercise 4 firing pattern (right-handed officers)

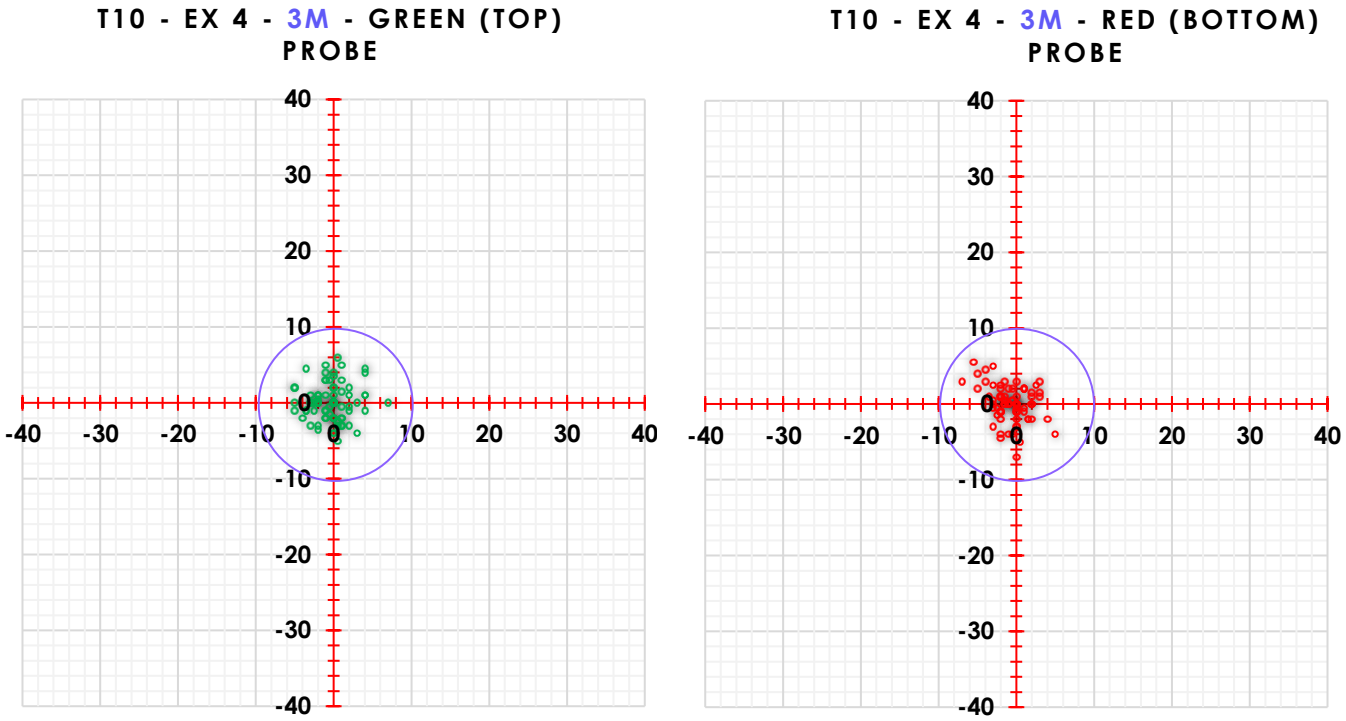
The mean radial distance from POA to POI on the first shot was 29mm and 26mm on the second in relation to the T10. The first shot (top probe) of the X2 was 40mm and T7 73mm.

All data for the X2 and T7 was recorded from POA (green circle, right-handed officers, red circle left handed officers), with the lower probe as close to the horizontal axis as possible. Therefore, the lower probe data must be adjusted for predicted probe spread.

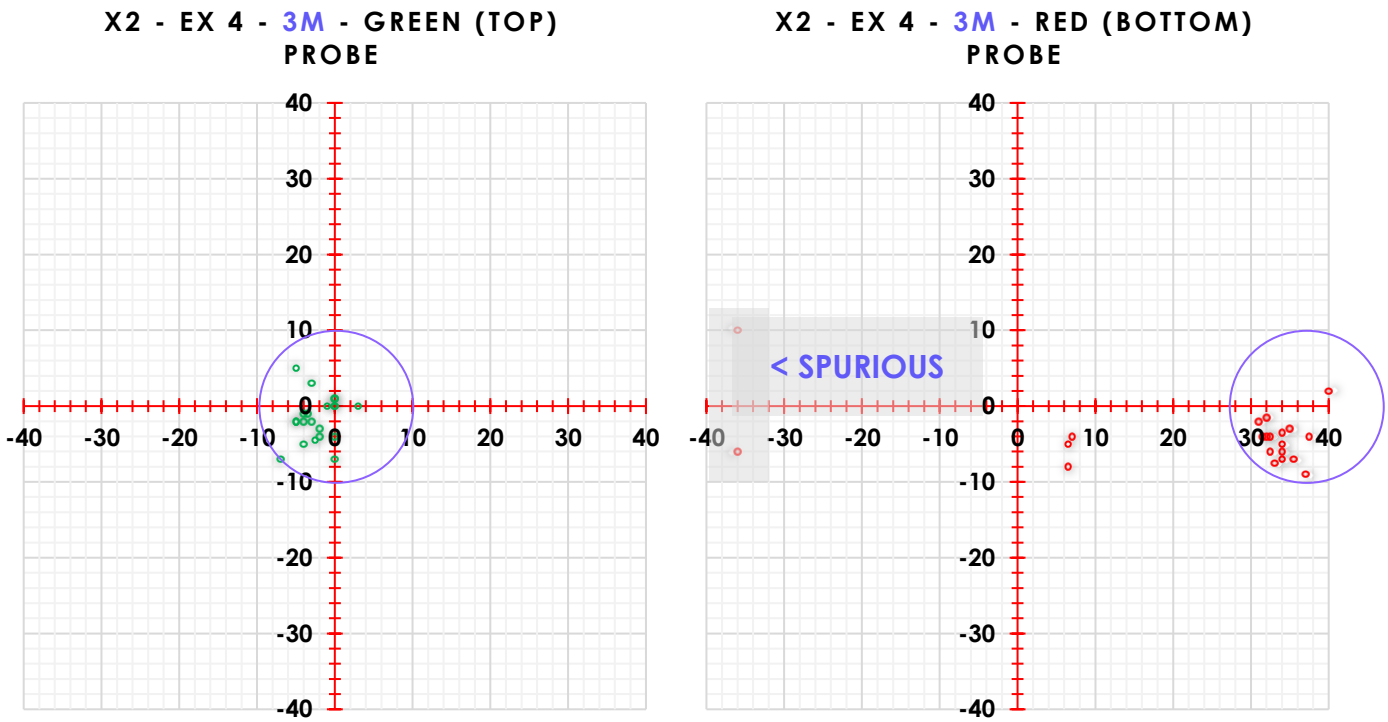
The CAST technical assessment of the X2[30] found the average probe spread of X2 at 3m was 37.6cm. Adjusting the horizontal data by 37.6cm the average distance from predicted POA to POI was 87mm. Similarly, the Dstl technical assessment of the T7[31] found the average probe spread of T7 at 3m, with a stand-off cartridge, was

[30] CED Replacement Project, Assessment of the TASER X2™ against the Police Operational Requirements, CAST Publication No.057/16 https://www.gov.uk/government/publications/cast-assessment-of-the-taserx2
[31] Physical Assessment of TASER 7™, Dstl/TR117685 v1.0, 13 March 2020

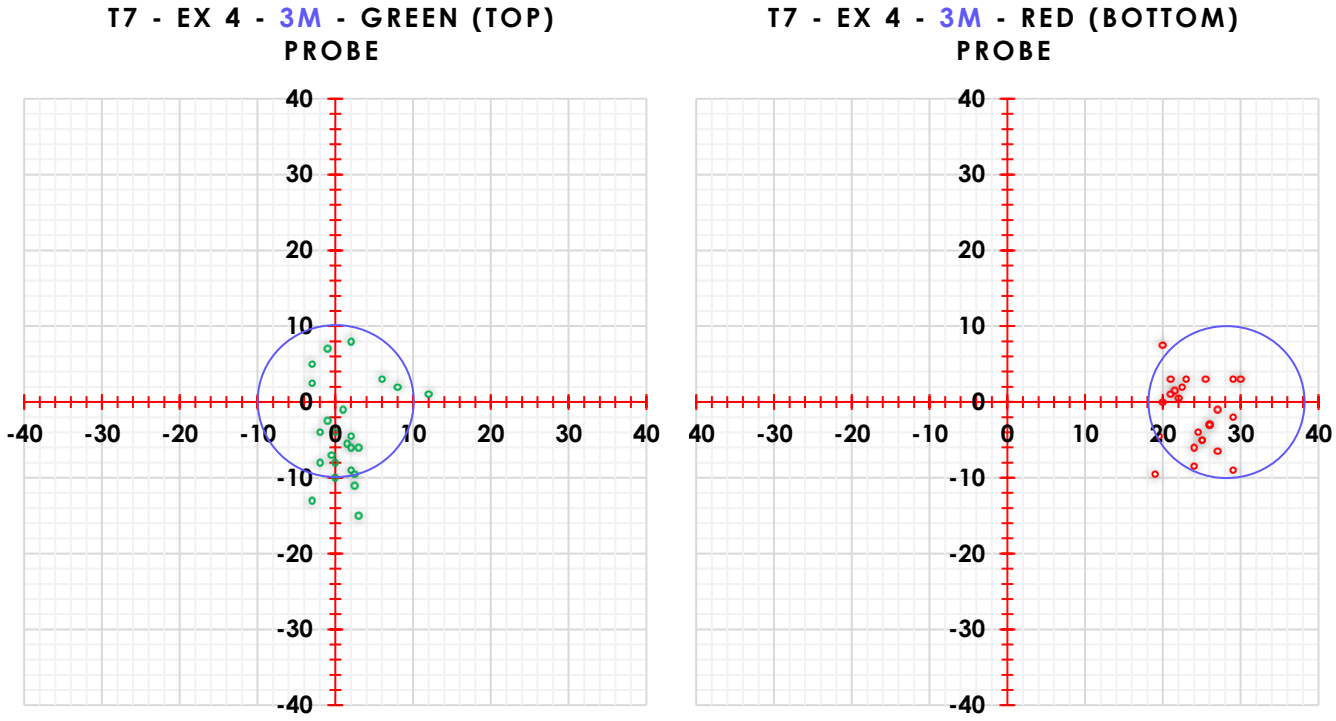
28.5cm. Adjusting the horizontal data by 28.5 cm the average distance from POA to POI was 97mm. (Note the graphs below are not adjusted).



Graph 8, exercise 4 (T10) probe dispersion



Graph 9, exercise 4 (X2) probe dispersion



Graph 10, exercise 4 (T7) probe dispersion

Considering graph 8 above it can be seen the T10 produced accurate and consistent results with no distinct bias in either the horizontal or vertical axis.

Graph 9 shows the dispersion for the X2, the circle being centred on the predicted location of the lower (right) probe. Whilst not as consistent as the T10, the X2 is still accurate in this regard. Some spurious data was noted (highlighted) which has been identified as a data recording issue, those data points do not reflect bona fide accuracy data.

Finally graph 10 shows probe dispersion of the T7 during exercise 4. Similarly, a circle is centred on the predicted location of the lower (right) probe. Whilst no lateral or vertical bias is apparent the dispersion is greater than that of the T10.

Key finding 6

Key finding

Given the nature of individually aimed probes of the T10 system, one could contend it is far easier to deliver probes to subjects in a supine, or other unconventional posture, than with the fixed probe spread of extant systems.

In addition, in this test, the probes were delivered with greater accuracy and consistency than with either an X2 or T7.

Exercise 5 – practical accuracy at 3m including supplementary drills

Exercise 5 examined the ability to deliver a warning display and further probes should the first attempts fail. Officers were required to deliver six probes as accurately and quickly as they could (see figure 33). This required them to move their point of aim as required by the exercise. They were also required to extend and reenergise the cycle.

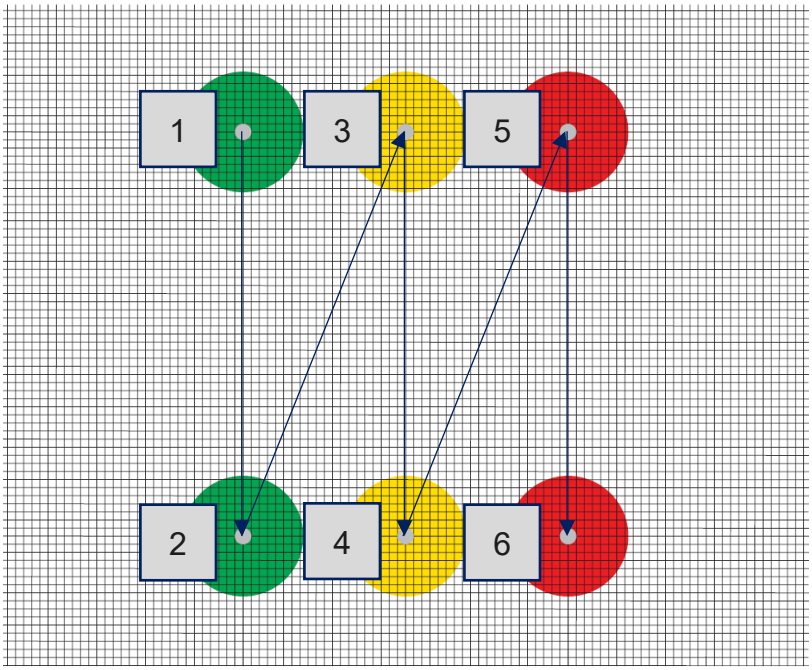


Figure 33, exercise 5 firing pattern

The examination of the time taken to discharge the probes offers a comparison of the speed and utility of the T10 in comparison to extant systems. Time was recorded by an observer with a stopwatch from the command to ‘engage’ to the discharge of the sixth/shot probe.

The accuracy data of the probes was consolidated for all six probes. The mean radial distance from POA to POI for the T10 was 33mm, for the X2 45mm and T7 63mm.

The time taken is summarised in table 20.

Table 20, comparison by device, time taken to fire six probes

Time taken (seconds)	Fastest	Slowest	Mean
 T10	2.27	10.96	5.5
 X2	7.78	30.62	12.8
 T7	6.22	15.12	9.3

In order to deliver six probes with a T10 the officers had to aim at six separate target areas and pull the trigger six times. With the X2 and T7 they had to aim and pull the trigger three times, reloading after the first two. It should also be noted that the T7 has cartridges paired and clipped together, whereas with the X2 they are two separate cartridges. Such paired cartridges may expedite reloading.

Therefore, the results above are consistent with the number and complexity of actions required. The T10 has a clear advantage in not requiring reloading, however what stands out is not just the speed with which probes can be delivered but without any notable degradation in accuracy. The mean distance from POA to POI only increased by 3mm to 4mm during this exercise in comparison to exercise 1.

Key finding 7

Key finding
The T10 can deliver probes rapidly and accurately. Should the first four probes fail in their attempt to create NMI, an officer with a T10 can swiftly deliver further probes, where their colleagues with an X2 or T7 would have to reload. Often this may not be an available option, due to the rapidly evolving nature of the incident and/or significant time taken to complete such an action. It also should be recognised that probes must be in the skin for T10

to create effective NMI and relevant training strategies are required to embed this concept.

The device event log for both the T10 and T7 records the time the trigger was pulled to the nearest millisecond. (Note: the X2 log does not offer these data to this level of accuracy). Examination of the event logs for exercise 5 can offer an insight into how quickly officers can deploy probes.

The table 21 below lists the mean elapsed time after the first trigger activation to the subsequent trigger pull. Clearly a T10 will only deploy one probe per trigger pull and the T7 two, the T7 requiring reloading after the first two cartridges/four probes.

It can be seen whilst the T10 is quicker to deploy six probes, it is slower to deploy four when the elapsed time from the first trigger pull to the trigger pull associated with the fourth probe (fourth for T10, second for T7) is considered, this time being 2.799s for the T10 and 1.247s for the T7.

This time difference assumes that the first trigger activation would be at the same time for both devices, which is unlikely to be the case given it is probable officers are able to gain a sight picture and pull the trigger quicker for the initial discharge with a T10 than a T7, as they are only aiming one probe as opposed to two. The data appears to bear this out with the mean gap between trigger activations for the T10 being 0.929s and 1.247s for the T7, the difference being 0.313s. Put simply, the T10 may have a 0.313s advantage. Therefore, the T10 activation time can be adjusted by 0.313s to account for a potential quicker first trigger activation. This is shown in table 21 below as ‘T7 adjusted’.

Table 21, comparison of trigger activation times T10 and T7

Elapsed time (seconds)	Trigger activation probe 2	Trigger activation probe 3	Trigger activation probe 4	Trigger activation probe 6	Mean activation trigger gap
T10 all users	0.934	1.899	2.799	4.645	0.929
T10 AFOs	0.718	1.415	2.116	3.577	0.715
T10 STOs	0.961	1.956	2.939	4.904	0.981
T10 NUOs	1.038	2.139	3.037	4.950	0.990
T7	0	1.247		8.683	1.247
T7 adjusted	0.313	1.56		8.996	1.247

An additional factor that may influence speed is the ability and competence of the operator. Given its similarity to firing a handgun, one would expect AFOs to perform better in this regard. The data supports this theory as AFOs were approximately a second and half quicker in deploying six probes than either STOs or new users. The difference between new users and STOs does not appear as noteworthy. (It should be noted five of the nine T7 users were AFOs).

If the first two probes fail to create NMI then an officer may need to deploy further probes. Whilst the T7 is quicker to deploy four probes, it should be remembered in the case of the T10, a third probe may be sufficient to create NMI due to polarity switching and cross-connect ability. Clearly a T7 can only deploy probes in multiples of two. In addition, where a device is reloaded it cannot make use of probes delivered from unloaded cartridges.

On average officers took 1.899s to deploy three probes with a T10 and 1.560s (adjusted) with the T7. Interestingly AFOs only took 1.415s to deploy three probes, being slightly quicker than the adjusted time for an T7.

Whilst the above comparison does not account for the time taken for the officer to evaluate the need for further probes, this should be consistent for both systems, therefore the analysis is still valid.

Exercise 6 – practical accuracy at unknown distance

Exercise 6 was conducted with HALT cartridges. The officer performed a warning display, on completion of which, the subject in a HALT suit walked towards the officer from 15m, out of range of all the devices. The officer was required to engage the subject when they thought they could successfully deliver probes, i.e. they were within the range of the device. The officer was not told what distance the subject was at, and no conventional range distance markers were provided. In addition, officers were not permitted to watch their colleagues conducting the exercise. Essentially the officer had to estimate when the subject was within a viable range relative to the device they were using.

The distance at which the officer fired was recorded using a laser measuring device. The zone that the probes engaged, along with the probe spread, was also recorded.

Figure 34, exercise 6 (X2)

The average distance at which officers engaged the subject was 8.2m with the T10, 5.6m with the X2 and 7.6m with the T7. It should be noted the maximum range of the X2 and T7 is 25ft (7.6m).

The average probe spread was 59.6cm for the T10, 54.1cm for the X2 and 48.6cm with T7. This excludes missed shots and those fired from too far away, which would not create a probe spread.

Table 22, exercise 6 engagement distance by device

Engagement distance	Maximum	Minimum	Mean
 T10	11.3m	2.9m	8.2m
 X2	6.8m	3.7m	5.8m
 T7	10.4m (exceeds max. range)	2.7m	7.5m[32]

Table 22 summarises the engagement distances for each device. Of note, of the 27 attempts of this exercise by T7 users 16 shots (59.3%) were taken beyond the

[32] Excludes shots beyond maximum range of device.

maximum range of the device (7.6m). This did not occur with either the T10 or X2, where no shots were taken beyond maximum range.

In considering the potential cause of this issue one should consider the operation of the X2 and T7. The X2 has a fixed angle of 7°, with the laser sight indicating this angle to the user. So, beyond the maximum range the spread of the laser would be such that it may provide a visual indication that the subject is beyond the maximum range, as the probe spread appears too big (circa 98cm[33], measured at 94cm in range environment).

In contrast, the T7, where fitted with the stand-off cartridge, has a 3.5° probe spread, half that of an X2. At 8m, just beyond the maximum range of 7.6m, the probe spread indicated by the laser should theoretically be approximately 49cm[34], (measured at 80cm in a range environment). Dstl[35] testing of the T7 identified the mean probe spread at 7.6m as 67cm. Accepting that probe spread just beyond the effective range of the device will be more than this, the laser on the device may create the illusion a viable probe spread is deliverable relative to the distance. Therefore, an officers' ability to estimate the distance is key to successfully deploying probes at or near the maximum range.

One could contend this did not occur with the T10 simply because its maximum range is so great in comparison to CEDs officers are used to.

[33] Given b=800cm and $\angle \alpha$ =7, a = 98.2cm
[34] Given b=800cm and $\angle \alpha$ =3.5, a = 48.9cm
[35] Physical Assessment of TASER 7™, Dstl/TR117685 v1.0, 13 March 2020

The target zone was also recorded during exercise 6 and is summarised in table 23.

Table 23, exercise 6 probe disposition by zone

Zone	T10 		X2 		T7 	
H (head)	3	1.9%	2	3.4%	0	0.0%
N (neck)	2	1.2%	0	0.0%	0	0.0%
C (chest)	9	5.6%	4	6.8%	1	2.0%
G (groin)	2	1.2%	1	1.7%	0	0.0%
U1 (right arm lower)	3	1.9%	0	0.0%	0	0.0%
U2 (right arm upper)	2	1.2%	0	0.0%	1	2.0%
U3 (torso)	59	36.4%	24	40.7%	17	34.0%
U4 (left arm upper)	3	1.9%	0	0.0%	0	0.0%
U5 (left arm lower)	0	0.0%	0	0.0%	0	0.0%
L1 (right leg upper)	21	13.0%	3	5.1%	3	6.0%
L2 (left leg upper)	30	18.5%	6	10.2%	7	14.0%
L3 (right leg lower)	11	6.8%	4	6.8%	4	8.0%
L4 (lower leg lower)	6	3.7%	8	13.6%	6	12.0%
M1	1	0.6%	0	0.0%	0	0.0%
M2	0	0.0%	0	0.0%	0	0.0%
M3	4	2.5%	0	0.0%	4	8.0%
M4	0	0.0%	0	0.0%	0	0.0%
M5	3	1.9%	0	0.0%	0	0.0%
M6	2	1.2%	5	8.5%	3	6.0%
M7	1	0.6%	1	1.7%	0	0.0%
M8	0	0.0%	1	1.7%	4	8.0%
Total	162		59		50	
Total misses	11	6.8%	7	11.9%	11	22.0%
Total sensitive area	7	4.3%	3	5.1%	0	0%

Authorised professional practice in relation to CEDs[36] and supporting training material recognise the need to avoid sensitive areas of the body including the head, neck and groin due to the increased risk this may present. In exercise 6, 4.3% of T10 probes hit a sensitive area of the body, for the X2 this was 5.1% and T7 it was zero.

The T10 and X2 shots that hit sensitive areas were taken at the distances indicated in table 24 below.

[36] **Conducted energy devices (Taser) | College of Policing**

Table 24, exercise firing distance of shots to sensitive areas

	 T10	 X2
Head	8.2m	4.4m
	10.7m	6.8m
	6.m	
Neck	7.4m	
	7.6m	
Groin	7.5m	5.4m
	7.6m	
Mean	7.9m	5.5m

Given the mean distance at which officers engaged the target was 8.2m for the T10 and 5.8m for the X2, examining the data in table 24, there does not appear to be any obvious correlation between such shots and excessive firing distance. Indeed, in the case of the T10 and X2 the mean distance at which a shot was fired to a sensitive area was slightly less than the mean for all shots.

Miss rates also varied by device; 6.8% for the T10, 11.9% for the X2 and 22.0% for the T7 (this includes shots out of range).

Key finding 8

Key finding

The T10, in exercise 6, had a low rate of missed shots. The rate of shots to sensitive areas was less when comparing the T10 to the X2.

Although the T7 had no shots to sensitive areas, its high probe miss rate (two or three times that of the X2 and T10) makes unsafe any comparison with the other two devices. (See exercise 7 below)

The need for officers to avoid shots to sensitive areas, where possible, must remain a key requirement in training.

Key finding 9

Key finding

Where confronted with an approaching subject, officers, on average engaged the subject at 8.2m. Notwithstanding the limitations of this exercise, these data may inform training design.

Exercise 7 – dynamic accuracy and utility

Exercise 7 consisted of a series of six scenarios, in rapid succession, where the officer was confronted with a role-playing subject in a HALT suit, presenting a threat. They broadly simulated an operational encounter. It therefore included additional operationally relevant factors outlined below, and the role actor behaved to encourage the desired action (e.g. simulating ineffectiveness). The scenarios were as follows:

1. Subject carrying bag across chest/torso, holding knife. First probe pair ineffective (obstructed subject, further probe deployment).
2. Subject with hammer chasing victim, corner to corner (moving subject).
3. Subject with bottle moving side to side, subject to get back up (moving subject, reenergise).
4. Subject with machete. Slashing at wires. First probe pair ineffective (further probe deployment).
5. Subject with hammer and bin lid and moving (obstructed subject).
6. Subject with knife, threatening self-harm, sitting in chair (warning display, probe deployment unconventional posture).

Although the original intention was to randomise the order, the logistics and coordination of multiple role players delivering six scenarios in rapid succession whilst capturing relevant data made this impossible. To have done so would have slowed the tempo of the scenarios considerably and detracted from the purpose of the exercise.

As the officers were not permitted to view one another, the fact the scenarios were in the same order was not seen as detrimental to aim of the exercise. However, when they undertook the exercise with their existing device the order was reversed so they could not anticipate the scenario.

In each exercise the probe location was recorded by zone along with the probe spread. The mean probe spread for exercise 7 was 45.8cm for the T10, 37.3cm for the X2 and 57.0cm for T7, all of which are in excess of the minimum probe spread identified by Ho *et al* (2012)[37] (minimum 9 inches or 23cm, optimum 12 inches or 30cm).

Table 25, exercise 7 probe disposition by zone

	 T10		 X2		 T7	
H (head)	0	0.0%	0	0.0%	2	1.9%
N (neck)	1	0.3%	0	0.0%	0	0.0%
C (chest)	22	7.1%	4	3.3%	6	5.6%
G (groin)	8	2.6%	2	1.7%	5	4.6%
U1 (right arm lower)	3	1.0%	1	0.8%	5	4.6%
U2 (right arm upper)	5	1.6%	0	0.0%	2	1.9%
U3 (torso)	70	22.4%	26	21.7%	23	21.3%
U4 (left arm upper)	5	1.6%	1	0.8%	2	1.9%
U5 (left arm lower)	2	0.6%	1	0.8%	1	0.9%
L1 (right leg upper)	39	12.5%	36	30.0%	22	20.4%
L2 (left leg upper)	24	7.7%	13	10.8%	11	10.2%
L3 (right leg lower)	43	13.8%	10	8.3%	12	11.1%
L4 (lower leg lower)	46	14.7%	7	5.8%	6	5.6%
M1	0	0.0%	0	0.0%	0	0.0%
M2	0	0.0%	0	0.0%	0	0.0%
M3	0	0.0%	0	0.0%	0	0.0%
M4	1	0.3%	0	0.0%	0	0.0%
M5	1	0.3%	0	0.0%	1	0.9%
M6	3	1.0%	0	0.0%	0	0.0%
M7	1	0.3%	0	0.0%	0	0.0%
M8	0	0.0%	0	0.0%	1	0.9%
BH	0	0.0%	0	0.0%	0	0.0%
BC	2	0.6%	2	1.7%	0	0.0%

[37] Ho, J., Dawes, D., Miner, J. *et al.* Conducted electrical weapon incapacitation during a goal-directed task as a function of probe spread. *Forensic Sci Med Pathol 8*, 358–366 (2012).

BG	2	0.6%	0	0.0%	0	0.0%
BU1	0	0.0%	1	0.8%	1	0.9%
BU2	2	0.6%	1	0.8%	2	1.9%
BU3	15	4.8%	9	7.5%	3	2.8%
BU4	2	0.6%	0	0.0%	0	0.0%
BU5	0	0.0%	0	0.0%	0	0.0%
BL1	5	1.6%	3	2.5%	3	2.8%
BL2	6	1.9%	2	1.7%	0	0.0%
BL3	0	0.0%	1	0.8%	0	0.0%
BL4	4	1.3%	0	0.0%	0	0.0%
Total	312			120	108	
Total misses	6	1.9%	0	0%	2	1.8%
Total sensitive area	9	2.9%	2	1.7%	7	6.5%

The target zone was also recorded during exercise 7 and is summarised in table 25.

It should be noted one scenario in particular, (no. 2), could result in probe placement to the rear/back of the subject. The same zoning method was used but prefixed with the letter B where this occurred. However, it should be noted the relative risk to sensitive areas may be lower to the rear of the body. For example, the risk associated with shots to the buttocks would be significantly less than those to the groin/genitalia. As a result, shots in the 'BG' zone have been disregarded in the analysis of shots to sensitive areas. This rational was **not** applied to the head or neck, although a similar argument could be made to a lesser degree.

In exercise 7, 2.9% of T10 probes hit a sensitive area of the body, for the X2 this was 1.7% and T7 it was 6.5%.

Miss rates also varied by device; 2.9% for the T10, zero for the X2 and 1.8% for the T7.

It should be recognised exercise 7, by design, was the most dynamic of all the exercises conducted, and involved operationally relevant factors such as movement, selection of probe placement etc. Whilst every attempt was made by the role actors and conducting staff to make scenarios consistent for all the officers, the actions of the officer and other factors can subtly change the parameters of the scenario (e.g. deployment distance, posture of the subject etc.). However, this is also consistent with how such an incident may unfold in reality.

In addition, it would have been the first-time new users had been 'exposed' to such an exercise, noting new users only fired the T10.

Such factors can impact on accuracy and therefore influence missed shots and those to sensitive areas.

Miss rates were low for all three devices, much lower than reported by Sheridan and Hepper [2022][38] who found 17% of one or both probes missed the subject during operational use of the X2 in the UK.

Whilst the miss rates identified in this exercise may not translate directly to operational use given the limitations of the exercise, it does indicate the T10 does not vary significantly from extant devices in this regard.

In relation to probe hits to sensitive areas, Dstl's [2019][39] study of officer reported data found that 3.5% of probes were to the head/neck zone and 9.6% to the groin (note this is the zone of the body the probe hit, it does not necessarily mean the probe penetrated the skin or caused an injury to this area).

Notwithstanding the limitations of this exercise all three devices had lower rates of probes engaging sensitive areas than that indicated by operational data. One could conclude the T10 does not vary significantly from extant devices in this regard.

Key finding 10

Key finding

During exercise 7, the frequency of shots that missed or hit a sensitive area was low for the T10 and broadly similar to that of extant devices, and lower than such rates in operational use.

[38] Sheridan RD, Hepper AE. An analysis of officer-reported TASER X2™ probe discharge effectiveness in the United Kingdom. J Forensic Leg Med. 2022 Oct;91:102417. doi: 10.1016/j.jflm.2022.102417. Epub 2022 Aug 13. PMID: 35987156.
[39] Dstl, Review of the UK use of the TASER® X2™ conducted energy device after 16 months of operational service, DSTL/CR115459 v1.1 12 June 2019

Reliability

System requirement SR 29 requires that: *'The system should be reliable in use and function as expected when activated.'*[40] The 'threshold' requirement is specified at 95% and the objective is 99.9%, although the basis on how this is calculated is not further defined, for example is this each time the trigger is activated or each time the device used? (i.e. one incident/exercise attempt). For simplicity the latter approach was employed in the statistics offered below, although all faults/symptoms were noted and recorded. If more than one fault occurred, for categorisation, the most serious fault was used.

The T10 was assessed in 11 discrete exercises, and the X2 and T7 in seven exercises (see Table 5). For the T10 this was undertaken by 27 participants, the X2 it was ten and for the T7 nine. Given each exercise was undertaken three times, the total number of exercise attempts requiring the deployment of live cartridges was as follows:

- Taser 10 27 x 9 x 3 = 729
- Taser X2 10 x 5 x 3 = 150
- Taser 7 9 x 5 x 3 = 135

Two of the exercises (six and seven) involved the deployment of HALT training cartridges. Given they are not part of the operational aspect of the system, and this part of the system differs in many ways, they are discussed separately.

Reliability results – live operational cartridge deployments

Faults were recorded against the exercise/participant/device. Based on the classification above (categories A to E, see table 4, page 45) the number of exercise attempts where one or more fault(s) occurred were as follows (percentage of overall exercise attempts is shown in parenthesis):

[40] NPCC Conducted Energy Devices System Requirements Document, Version 1.5, 24.4.23

Table 26, faults by category and CED

	Category A Safety critical fault	Category B Major fault	Category C Identified fault	Category D Fault cleared	Category E Negligible fault/issue	No fault
T10 	31 (4.3%)	0	13 (1.8%)	1 (0.1%)	1 (0.1%)	681 (93.7%)
X2 	2 (1.3%)	0	0	0	0	148 (98.7%)
T7 	2 (1.5%)	3 (2.2%)	0	0	0	130 (96.3%)

Category A, safety critical faults – Taser 10

A safety critical fault, for the purposes of this trial was defined as:

"A fault that was not identified during function checking procedures (i.e. the device could have been deployed operationally in this state.) that would have resulted in an operational failure of the device."

They are safety critical as:

"Failure of device to deploy. Could result in injuries to officer/subject/public. Could have implications ranging from minor to fatal."

A category A, safety critical fault should not be confused with a 'critical error' as highlighted by the device, although the two on occasion may coincide. Of the three occasions a critical error did show on the CID, all were associated with a category A fault.

Four different types of safety critical faults were observed in the T10 system (number of exercise attempts where such a fault occurred are shown in parenthesis):

- Trigger pulled, no discharge (device detected as discharged) (24)
- Single trigger pull, two probes discharged (‘double-tap’) (3)
- CID goes blank upon firing, no discharge (2)
- Probe detaching, no wire visible (2)

Trigger pulled, no discharge

The most significant issue with the Taser 10 occurred during exercise 5 during week 1 (officers 1 to 11). Five of the 11 devices in use exhibited a category A fault during this exercise whereby the trigger was activated but the device failed to deploy probes, however the device registered a deployment. This type of fault constituted 24 of the 31 category A faults. Typically, when this fault occurred, the officer was pulling the trigger eight times to deploy six probes. For example, device T2 fired by participant 2, required eight trigger pulls to deploy six probes during exercise 5. The device registered all eight trigger pulls and incorrectly logged eight cartridge deployments in the event log.

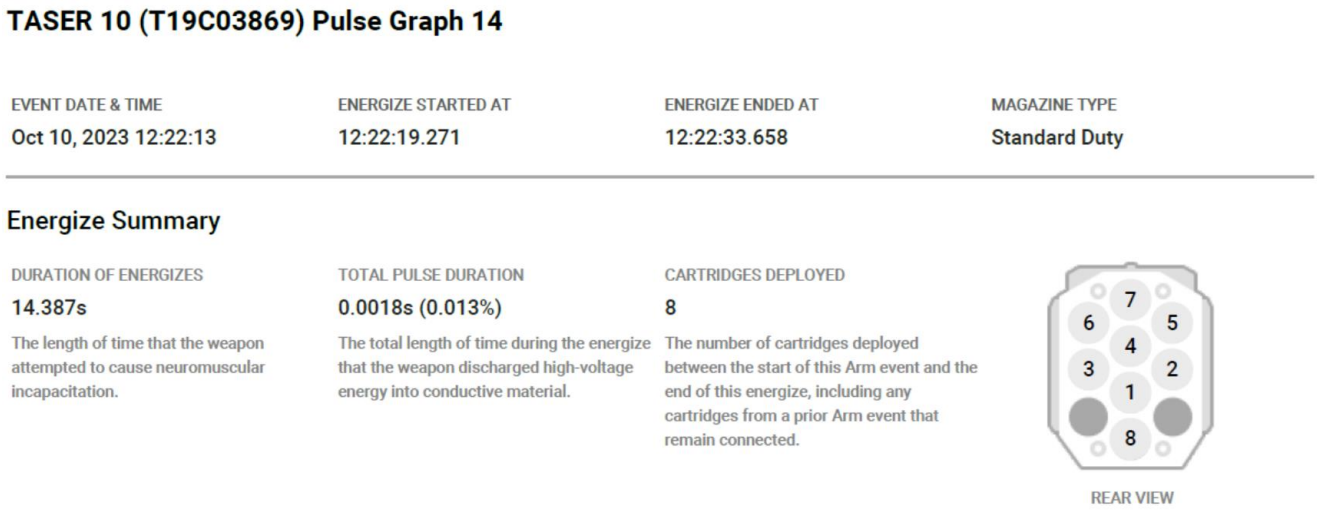


Figure 35, event log and pulse graph

When the magazine was removed from the device, it was photographed:

Figure 36, magazine (front view) showing unfired cartridges

As can be seen from figure 35, the device has registered eight deployed cartridges, yet figure 36 clearly shows cartridges six and seven did not deploy, which was entirely consistent with observations.

During week 2 (officers 12 to 27), exercise 5 was conducted with two separate magazines, instead of reloading the same magazine for each of the three attempts. Only one occurrence was observed in exercise 5 on week 2, however other occurrences of this fault type were observed throughout other exercises.

Eight of the 24 faults of this type were limited to one device and participant (device labelled T2). This device has been returned to Axon for further examination.

This type of fault was largely associated with the third to seventh tigger pull. It was observed in nine out of 22 devices (41%), five of which were on multiple occasions. By device they were as follows (number of faults in parenthesis):

- Week 1 – T2 (7), T4 (3), T7 (1), T8 (1)
- Week 2 – T13 (1), T15 (3), T16 (1), T1* (3), T22 (4)

* Device T1 was used in week one, without fault.

Devices T1, T3, T5, T6, T8 were used during both weeks. All other devices were only used for one of the weeks.

Where this fault occurred, all unfired cartridges were quarantined, and test fired in a different device. All fired successfully which would appear to eliminate a cartridge fault as a potential cause.

Single trigger pull, two probes discharged

During three of the exercises, two officers experienced a single trigger activation, which discharged two probes, colloquially referred to as a ‘double-tap’. Of note is two of them were by officer 2, using device T2 which had a significant number of issues with none discharge following a trigger pull (see above). Therefore, this should be viewed in the context the officer may be ‘trying harder’ to make the device work, i.e. being increasingly deliberate with the trigger.

However, one occasion was captured on video where the officer’s trigger finger can be clearly observed. There is a clear ‘pull and release’ and the officer’s finger does not linger on the trigger. Subsequent examination of the download revealed the following:

First occurrence during exercise 2B:

- 15:37:07.889 Standard Duty Magazine (10) detected
- 15:37:08.891 Trigger pulled
- 15:37:08.942 Cartridge 1 deployed
- 15:37:09.037 Trigger pulled
- 15:37:09.067 Cartridge 2 deployed

Second occurrence during exercise 3A:

- 16:05:22.080 Standard Duty Magazine (6) detected
- 16:05:24.774 Trigger pulled
- 16:05:24.802 Cartridge 1 deployed
- 16:05:24.933 Trigger pulled
- 16:05:24.961 Cartridge 2 deployed

As can be seen from above, on the first occurrence the trigger pulls were detected as 0.146s apart. On the second occasion (which is on video) they are 0.159s apart.

The third occasion was with officer 22 and device T3. The officer stated they felt like there was a ‘delay’ between pulling the trigger and it discharging two probes. No record of a double discharge, similar to that of device T2, could be found on the

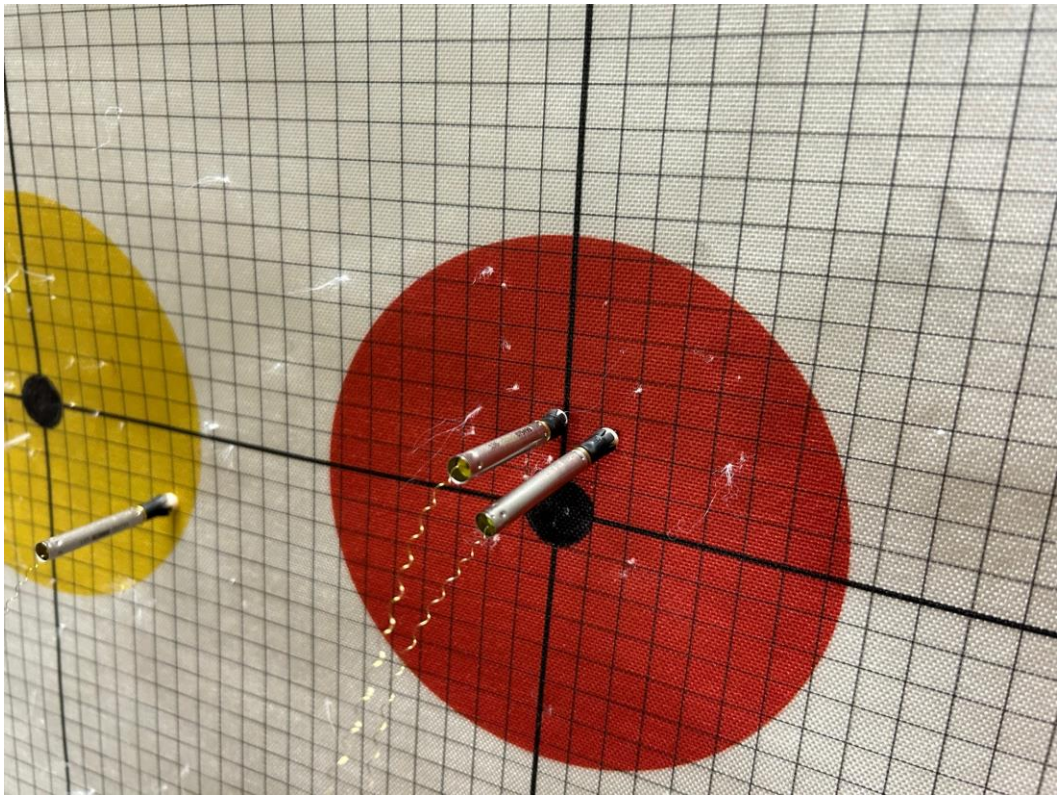


Figure 37, 'double tap' target and probes

event log. However, the target was photographed immediately afterwards. Figure 37 clearly shows two probes have indeed impacted the target just over a centimetre from one another, whereas the exercise required the next probe should have been on the lower red circle.

Examining the event log, it can be seen the fourth shot did take longer between trigger pull and deployment of the cartridge than the other shots:

- 12:37:35.624 Trigger pulled
- 12:37:35.654 Cartridge 1 deployed (0.030s)
- 12:37:36.451 Trigger pulled
- 12:37:36.487 Cartridge 2 deployed (0.036s)
- 12:37:36.509 Energize started due to trigger
- 12:37:37.344 Trigger pulled

- 12:37:37.383 Cartridge 3 deployed (0.039s)
- 12:37:38.227 Trigger pulled
- 12:37:38.396 Cartridge 4 deployed (0.169s)
- 12:37:38.418 Energize timer reset due to trigger
- 12:37:39.241 Trigger pulled
- 12:37:39.299 Cartridge 5 deployed (0.058s)
- 12:37:39.321 Energize timer reset due to trigger
- 12:37:40.146 Trigger pulled
- 12:37:40.211 Cartridge 6 deployed (0.065s)
- 12:37:40.233 Energize timer reset due to trigger

Whilst the officer may have mistaken the fourth and fifth shot it did indeed take longer from ‘trigger pull’ to deployment than typically encountered.

A third officer, officer 13, also had a ‘double-tap’ during exercise 5. However, they stated it was them rather than the device. In the interests of prudence, the device log was examined.

12:27:34.240	Trigger pulled
12:27:34.286	Cartridge 1 deployed
12:27:34.363	Trigger pulled
12:27:34.392	Cartridge 2 deployed
12:27:34.414	Energize started due to trigger
12:27:35.138	Trigger pulled
12:27:35.175	Cartridge 3 deployed
12:27:35.197	Energize timer reset due to trigger
12:27:35.913	Trigger pulled
12:27:35.944	Cartridge 4 deployed

Figure 38, device T13 event log extract

As can be seen from figure 38 the trigger pulls were 0.123s apart, broadly consistent with the other ‘double taps’.

Discussions with Axon revealed that, unlike the T10, the T7 firmware prevents trigger pulls too close together, to use their words it has a ‘blackout window’ of 200 milliseconds. Therefore, had it been a T7, the device would not have deployed cartridges where the trigger pulls were detected less than 200 milliseconds apart as

in the above examples. However, this feature was not included in the T10 system as tested in the initial user handling trial (UHT1).

They went on to state:

> TASER 10 does not currently have a trigger blackout. We are planning to add this blackout window to TASER 10 in the next FW [firmware]. We are finalizing our testing to confirm the exact timeframe for the blackout window, but right now believe we will put in a 100-millisecond blackout window. The reason for the shorter time is because with the new mechanical trigger, users are able to pull it more quickly in succession.

One could postulate that the cause of this issue is the device detecting two trigger pulls, even though the officer clearly perceives they have not pulled the trigger twice. The officer's perception, in one of the cases, is supported by video evidence that they did not visibly pull the trigger twice.

Given the remedial action proposed by Axon one could speculate that the issue may be improved or largely eliminated but the final details would require further consideration.

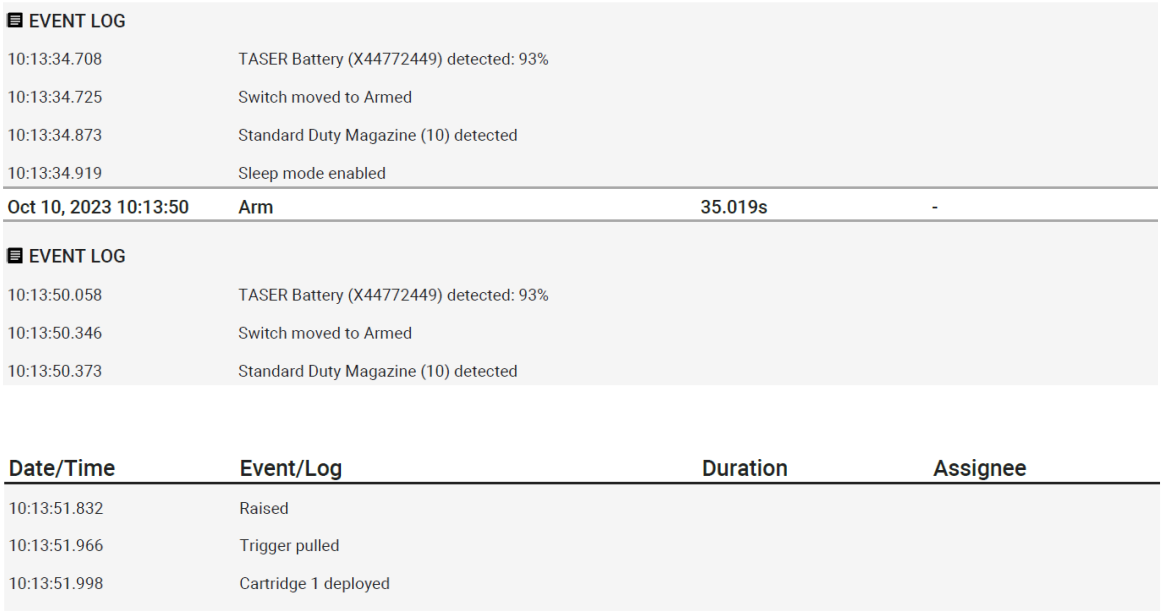
Device T2, during exercise 3B, exhibited a critical error fault warning (figure 39). However, this did not show on the event log. Given both this warning and the high incidence of faults with this device, it was withdrawn from the trial at this point. This was to ensure it did not detract further from what was primarily a 'user handling trial'. The device has since been returned to Axon for further investigation. The device and engineering logs have also been released to them via evidence.com.

Figure 39, device T2 exhibiting 'critical error' warning

CID goes blank upon firing, no discharge

Officer 6 and device T6 and officer 21 and device T1 experienced the CID going blank upon firing and no probe being discharged. This only occurred once with each device/officer.

The event log is shown below from device T6.



EVENT LOG

10:13:34.708	TASER Battery (X44772449) detected: 93%		
10:13:34.725	Switch moved to Armed		
10:13:34.873	Standard Duty Magazine (10) detected		
10:13:34.919	Sleep mode enabled		
Oct 10, 2023 10:13:50	**Arm**	**35.019s**	-

EVENT LOG

10:13:50.058	TASER Battery (X44772449) detected: 93%		
10:13:50.346	Switch moved to Armed		
10:13:50.373	Standard Duty Magazine (10) detected		

Date/Time	Event/Log	Duration	Assignee
10:13:51.832	Raised		
10:13:51.966	Trigger pulled		
10:13:51.998	Cartridge 1 deployed		

Figure 40, device T6 event log extract

One would assume the problem has occurred between 10:13:34.919 and 10:13:50.058, as there is no log of ‘switch moved to safe’, i.e. something appears to be missing. It can also be seen it enters ‘sleep mode’ 0.194s after being armed. (See figure 40)

Examining the event log for device T1, the function check immediately prior to this fault is logged but the device then merely logs entering sleep mode, being holstered and raised and lowered. (See figure 41)

Oct 24, 2023 10:03:52	**Arm**	**0.221s**	-
EVENT LOG			
10:03:52.099	TASER Battery (X44772467) detected: 93%		
10:03:52.115	Switch moved to Armed		
10:03:52.264	Standard Duty Magazine (10) detected		
10:03:52.286	Sleep mode enabled		
Oct 24, 2023 10:04:11	**Unholster**	**10.291s**	-
10:04:11.345	Holstered		
10:04:15.269	Unholstered		
10:04:15.299	Raised		
10:04:16.785	Lowered		
10:04:17.285	Raised		

Figure 41, device T1 event log extract

Probe detaching, no wire visible

This type of fault was observed twice, where the probe fired normally but no wire is visible between the probe and device. The first occurrence was with device T11 during exercise 4 and the second with device T22 during exercise 2A. It is possible wire is present but has been retained within the body of the probe. It is likely this was a cartridge issue rather than a device related issue.

On the first occasion the probe otherwise deployed normally on the second occasion the probe body behaved unusually has shown in figure 42 below.

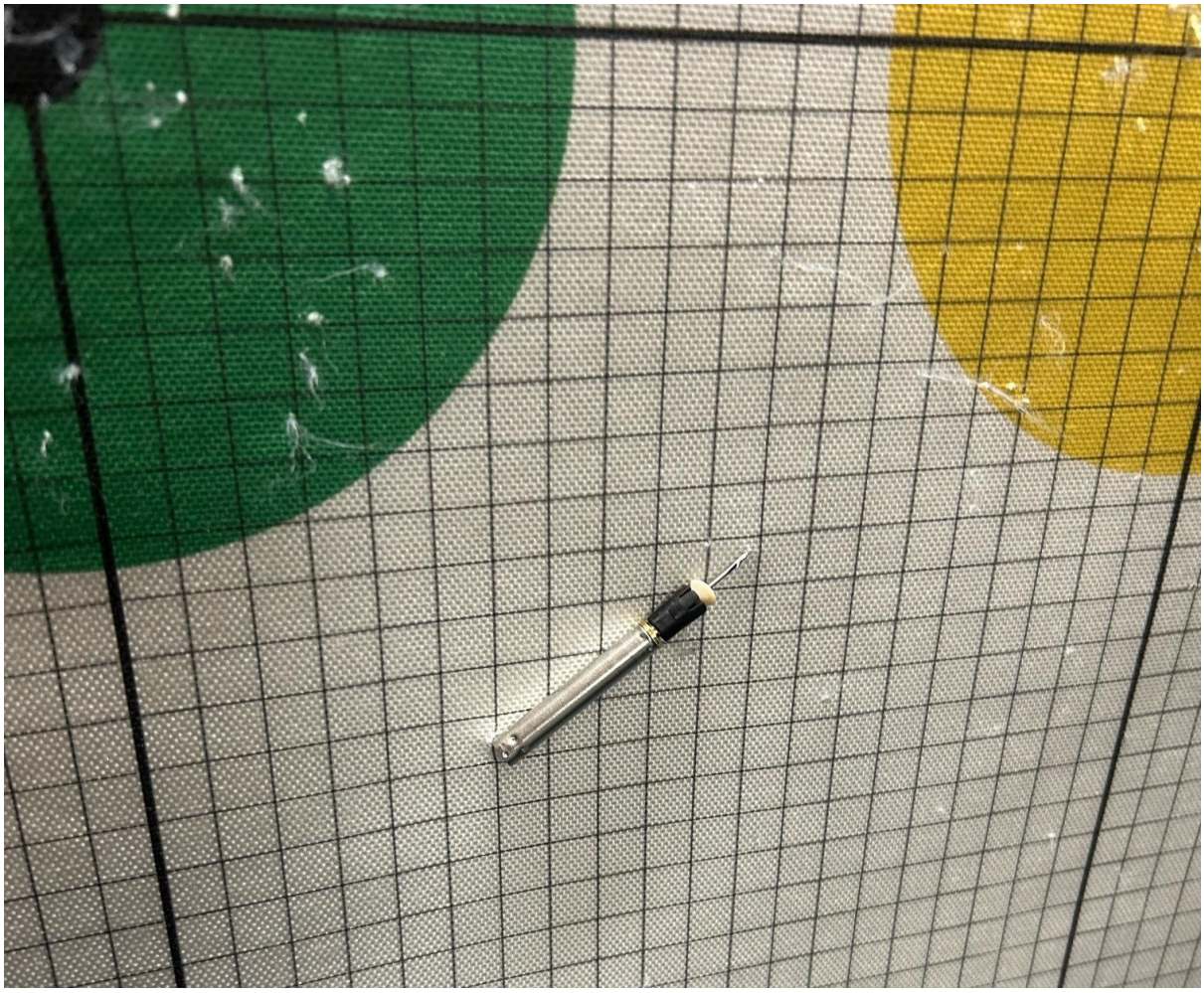


Figure 42, detached probe body

Upon further examination a small piece of wire could be seen (see figure 43) protruding from the probe body suggesting the wire may have snapped and not spooled out during deployment.

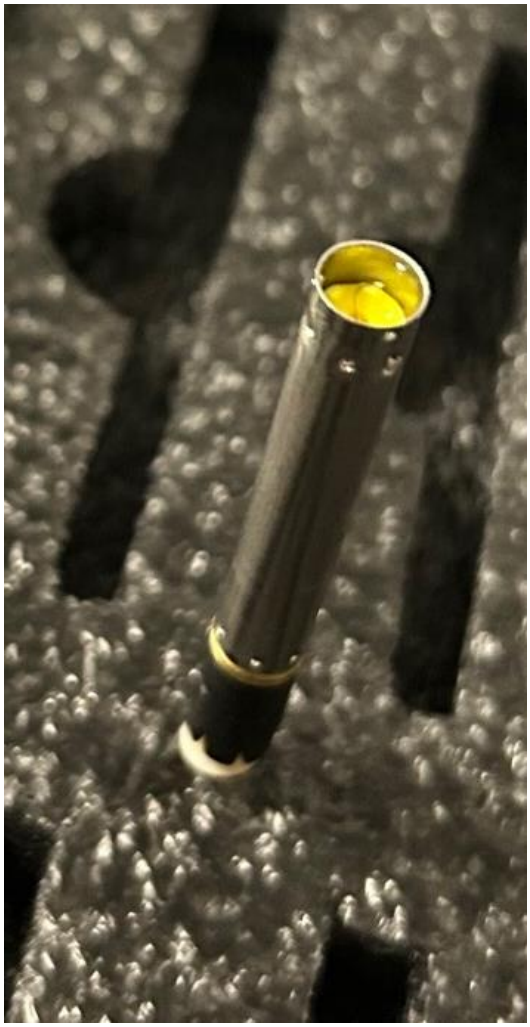


Figure 43, detached probe showing trace of wire

Category C, faults identified – Taser 10

An identified fault, for the purposes of this trial was defined as:

A fault identified through function checking procedures.

Such procedures would go beyond formal function checking and include faults noted during and after firing.

This type of fault, whilst notable, does not directly affect performance. During the trial 13 category C faults were identified. They were of three distinct types (number in parenthesis):

- Wire protruding out from probe body (2)
- Dart separated from probe body (1)
- No warning display upon activation (2)
- CID misreading number of spent/live cartridges (5)
- No CID (1)

Wire protruding from probe body

On two occasions, probes recovered from the target had a wire protruding from the probe body, this being thicker and more robust than the wire that connects the probe to the cartridge. They are noted as they caused minor injury to the officer removing them from the target.

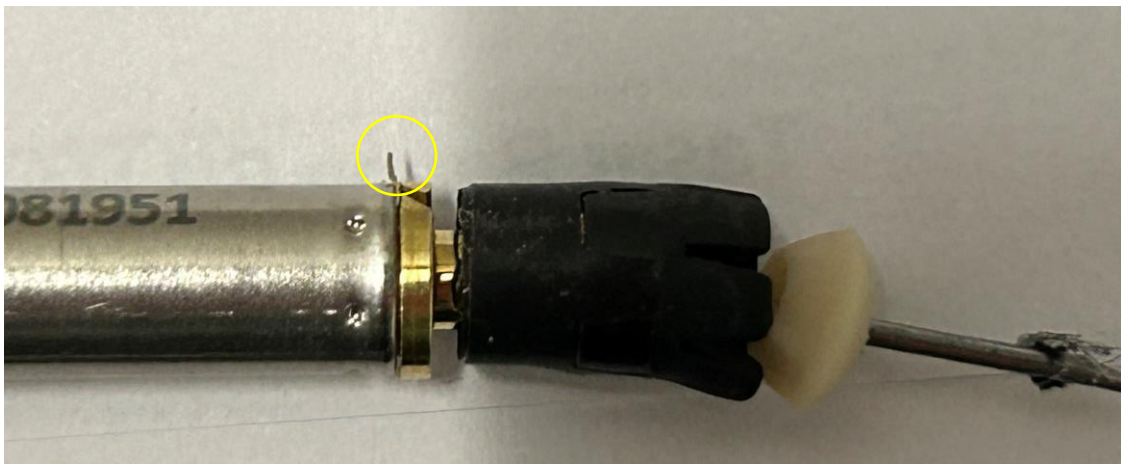


Figure 44, probe body with wire protruding, fired from 3m

As can be seen from figure 44 a wire is protruding perpendicular to the probe body, also of note is the dart is bent relative to the probe body. It is unlikely that the probe would fit inside the cartridge case with the wire protruding, therefore it is likely this is damage caused by impact with the target. A second example is shown in figure 45 below.

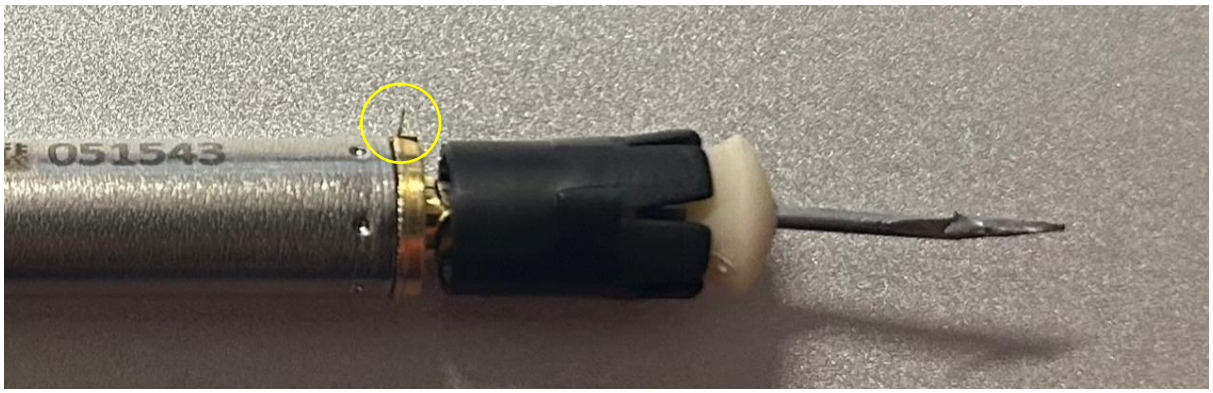


Figure 45, probe body with wire protruding, fired from 10m

The second example also appears to have a bent dart (see figure 45).
It should be noted that training targets are designed to be robust and withstand multiple uses of a CED. They are not a valid surrogate for a human subject.
Therefore, one could contend this issue is more relevant to training situations.
It is possible this fault occurred more frequently but went undetected. This issue has been noted and Axon were informed.

Key finding 11

Key finding

Although it was a rare occurrence, it is recommended training recognises that damaged T10 probes may have an unconventional 'sharps' hazard where probes are damaged.

Dart separated from probe body

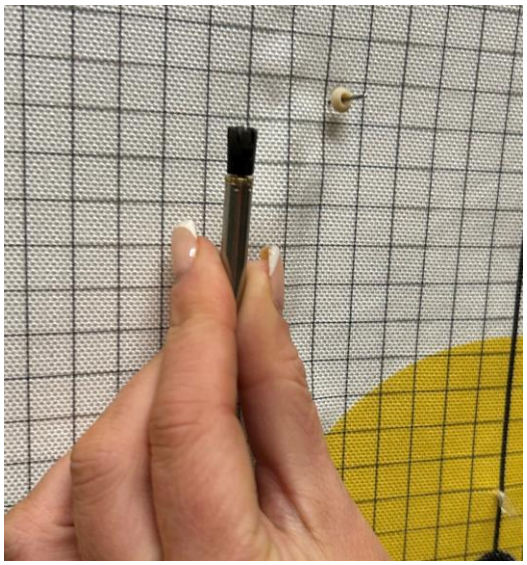


Figure 46, dart separated from probe body

On one occasion, whilst recovering the probe from the target, it was noted the dart had separated from the probe body (figure 46). One could speculate this is impact damage that may not manifest itself in operational use. However, a defect could not be ruled out.

No warning display upon activation

On two occasions, where the officer attempted a warning display, it did not function as the officer desired. Further investigation revealed that if the selector switch is moved immediately from the down/safe position to the momentary up position to activate a warning display, without pause in the armed position, then it will not activate. This was discussed with Axon who responded as follows:

> You are correct in that the T10 device right now does not engage the warning alert if the selector switch is moved immediately from in “SAFE” to the momentary up position to engage the “Warning Alert”.
>
> Right now, this is being observed because the selector switch is being moved to the momentary up “Warning Alert” position before the device has fully booted up from being in the standard “ARMED” position. Part of our continuous FW improvements are to speed up the bootup process, which would address this.
>
> However, we have also received feedback from multiple customers that throughout training, their officers are occasionally moving the selector switch up too high on arming the device and by accident engaging the warning alert.

Further enquires were made with Axon to ascertain the time delay in relation to the boot up time in such circumstances. They responded as follows:

> Yes, there is a 250-500 millisecond delay between moving the selector switch to the up (armed) position and the activation of the warning alert. This was implemented to address instances where some users were pressing too firmly on the selector switch when arming the device and inadvertently triggering the warning alert. The delay only applies to the warning alert. If the selector switch is moved to the up (armed) position and the trigger is pulled, there is no delay.

Since the College became aware of the specific details outlined above, this has not been an issue since and is simple to mitigate in training.

Warning alerts tend to happen in slower time when a threat is developing. From an operational perspective it is highly unlikely that a warning alert is so urgent that an officer would move the selector too quickly.

So, it would appear this issue is not necessarily a fault per se, rather a characteristic of the device, that training can recognise.

Key finding 12

Key finding

It is recommended training recognises that in order to operate a warning alert the T10 device must momentarily be in the armed position first.

Battery performance

All T10 batteries were fully charged before the start of the trial. The battery percentage, as indicated during the function check, was recorded at the start of each exercise. The exercises were conducted indoors at ambient room temperature.

At the start of exercise 1 the average battery percentage was indicated as 94%. At the start of exercise 3B (the last exercise firing live cartridges) the average battery percentage was 74%.

In losing an average of 20% battery capacity each device had typically:

- fired 66 cartridges, including their associated cycle
    - 57 with laser and torch
    - 9 in stealth mode
- performed 3 warning displays
- extended 3 cycles
- reenergised 3 cycles

This far exceeds what a single device would be expected to perform in operations and possibly in training.

Key finding 13

Key finding

Based on observations over the course of the three trials, the batteries in the Taser 10 performed well, only losing 20% of their indicated charge despite extensive use.

Faults and observations with HALT system

Whilst HALT cartridges and their associated blue magazine do not form part of the operational system, observations and faults remain worthy of note and further consideration. As they do not form part of the operational system any issues do not necessarily fall neatly into the fault categories identified above, due to many of the risks/consequences being absent. Therefore, a simple narrative is provided.

Only one T10 device exhibited a fault during exercise 6, with no device faults observed during exercise 7. Having successfully completed a function check, despite several attempts, the device refused to fire, similar to the fault type observed with live cartridges. The cartridges appeared to have registered normally. Attempts were made to ‘troubleshoot’ the issue by reloading/reseating the magazine to no avail. On

Figure 47, T10 with HALT magazine fitted showing yellow sidelight

Figure 48, T10 with HALT magazine showing blue sidelight

two such attempts the rail sidelight was yellow (indicating live operational cartridges) rather than blue for the HALT cartridges and magazine that was indeed loaded (see figures 47 and 48).

Upon examining the event log the function checks appear normal, however the log does show a ‘standard duty magazine’ when HALT was used exclusively during this period. Live cartridges and magazines were excluded from the area. It did not log any fault, nor the attempts to fire (see figure 49).

Oct 26, 2023 10:01:50	Arm	32.083s	-
EVENT LOG			
10:01:50.756	TASER Battery (X44772467) detected: 86%		
10:01:50.772	Switch moved to Armed		
10:01:50.919	Standard Duty Magazine (9) detected		
10:02:12.645	Switch moved to Safe		
10:02:14.353	Magazine removed		
10:02:22.805	Sleep mode enabled		
Oct 26, 2023 10:02:46	Arm	13.918s	-
EVENT LOG			
10:02:46.058	TASER Battery (X44772467) detected: 85%		
10:02:46.345	Switch moved to Armed		
10:02:46.371	No magazine detected		
10:02:46.389	HALT Magazine (0) inserted		
10:02:49.729	Switch moved to Safe		
10:02:55.632	Holstered		
10:02:59.943	Sleep mode enabled		

Figure 49, event log extract showing 'standard duty magazine' rather than HALT

The device failed to fire several times, in a similar manner to the faults described previously in relation to live operational cartridges.

One could speculate the device has not fired because it has recognised the miscommunication between the device, cartridges and magazine.

This fault type with HALT cartridges was limited to one device (T1) and one exercise (exercise 6). This device was excluded from exercise 7 to avoid detracting from what is largely a user handling trial.

Cartridges 'jammed' in magazine

On two occasions spent cartridges were jammed in the magazine and they could not be removed by hand in the conventional manner. It should be noted only approximately 6 to 8mm of the cartridge is exposed that the user can grip in order to remove it (see figure 50). Therefore, any additional resistance is difficult to overcome due to the lack of purchase, rather than it being jammed significantly.

They were removed with pliers providing additional grip. Whilst not necessarily a fault as such they did require additional steps to remove them.

Figure 50, HALT cartridge jammed in magazine

On two occasions the blue ‘collar’ on the cartridge became detached and remained in the magazine (see figure 51). Had this not been detected, and an attempt been made to load another cartridge, it could have become far more difficult to remove.

Figure 51, HALT magazine and detached cartridge 'collar'

Of note is the collar on HALT cartridges is of different dimensions and design to the standard live operational cartridge. This issue was not observed with the live operational cartridges in the first user handling trial, but it did occur during the subsequent handling trial.

Key finding 14

Key finding
Training of instructors should recognise both the potential HALT cartridge jamming issue and detached collar, and the simple expedients to resolve them.

Functionality of HALT system during scenario based training

It should be noted the HALT system, understandably, does not create an electrical connection with the subject, therefore the connection alert does not currently function. In addition, this means should an officer attempt to extend a cycle or re-energise deployed probes the T10 device simply produces a warning alert, as the device cannot detect any successfully deployed probes. This has the potential in scenario based training to not fully replicate the T10’s performance and risk creating ‘training scars’. By contrast the red inert magazines produce a connection alert

randomly between two and five cartridge deployments to simulate an operational deployment. It may be beneficial if Axon considered a similar approach to blue HALT magazines to enable the full functionality of the device to be explored in scenario based training.

Reliability further investigations

The reliability issues identified above were communicated to the NPCC project lead and Home Office. It was also recommended by the College that details of the identified reliability issues were communicated to Axon to understand the potential causes and whether:

- the system is inherently unreliable
- the nature of the trial was inducing faults
- whether remedial action can be undertaken by the manufacturer

The College's findings were communicated to Axon, in consultation with the Home Office as the body who commissioned this research. The data logs for all the identified devices were also released to Axon to facilitate further investigation.

In summary, Axon responded as follows:

> [1] Is the system inherently unreliable?
>
> After reviewing the initial documents, Axon believes these are isolated incidents where a fault occurred, which will be addressed through firmware updates.
>
> [2] Was the nature of the trial inducing faults?
>
> The nature of the trials was not inducing faults in these devices. However, it is possible that further education and troubleshooting could have allowed steps to be taken to address some of the faults that were observed to prevent them from recurring throughout the duration of the testing. Further details can be found below.
>
> [3] Can remedial action be undertaken by Axon?
>
> Axon's planned Firmware Update 1.3 (FW) in Q4 '23 will address most, if not all, of the issues reported.

> As outlined below, most faults were “Trigger pulled, no discharge (device detected as discharged)”. Globally, Axon has received a few isolated reports from our customers. Axon intends to conduct a follow up conversation with the College of Policing no later than November 22 to discuss the potential remediation to “Fault 1” [trigger pull no discharge]

Most of the remedial action proposed by Axon was by way of a firmware update (version 1.3.0), which they released globally on 18th December 2023. (See appendix 2 for the relevant Axon bulletin).

Given this firmware update may address the issues identified, and it makes some changes to the system as tested, it was recommended to the NPCC project lead and Home Office that a further trial was required to ensure that this firmware update had indeed addressed the issues and the system performed as expected. This second trial was predominantly focussed on reliability as opposed to repeating all aspects of the original user handling trial (UHT1), for which the data and its associated conclusions remain perfectly valid.

User handling trial 2 (UHT2)

This second user handling trial (UHT2) was conducted on 7th and 8th February 2024 as follows:

- all T10 devices updated to firmware version 1.3.0
- all devices cleaned and inspected according to Axon’s instructions
- trial conducted largely as per first trial, recognising test of reliability only
- trial conducted by T10 instructors to eliminate training phase
- eight instructors (four participants, four safety officers/observers), exercises completed in groups of four (as per original trial, maintaining same pace and rhythm)
- each participant allocated three devices, exercise 1 with first device, then exercise 1 second device, third device etc (maintaining same order and tempo of original user handling trial)

- trial exercises conducted as per original plan, removing exercises 6 and 7 (as they are HALT exercises and not part of the operational system)

Gather data on:

- reliability (faults recorded as per original categorisation)
- No accuracy data was to be analysed in any great depth (comparison to be made of least accurate 5% of shots in the original trial, identified below, rounded down to nearest 5mm/0.5cm for practicality):

    1. 3m laser sight >61mm (60mm)
    2. 5m laser sight >85mm (85mm)
    3. 5m fixed sight >195mm (195mm)
    4. 3m laser sight >61mm (60mm)
    5. 3m laser sight >72mm (70mm)

    2A 10m laser sight >190mm (190mm)

    2B 13.7m laser sight >238mm (230mm)

    3A 10m fixed sight >361mm (360mm)

    3B 13.7m fixed sight >316mm (310mm)

UHT1 commenced with 22 Taser 10 CEDs, one of which became unserviceable and was returned to Axon for further investigation (T2) at the end of the trial. The serviceability of a second device (T1) was also doubtful at the end of UHT1, but was included in UHT2 to see if the firmware update resolved the issues.

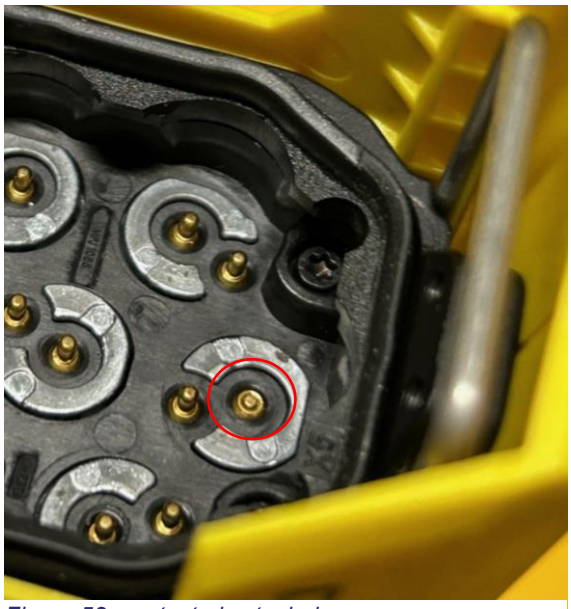


Figure 52, contact pin stuck down

During exercise 1 of UHT2 it became clear device T1 was indeed unserviceable and was withdrawn from the trial. Another device T4, repeatedly displayed critical errors on the information display and was

withdrawn from the trial. None of these critical errors appear on the device log.

Another device, T5, upon examination prior to the trial was found to have a contact ‘pogo’ pin stuck down (see figure 52).

This is a serviceable item, referred to by Axon as the ‘interposer bucket’ and can be replaced. An Axon engineer attended and replaced the part. Upon test firing, multiple cartridge bay errors were detected by the device and the device refused to fire on multiple cartridge bays, this was test fired again with a different magazine with a similar result. All cartridges subsequently fired successfully in a different device.

At this point devices T1, T4 and T5 were returned to Axon for further investigation. In total, four of the 22 devices (18%) have been returned to Axon at this juncture.

The remaining 18 devices proceeded to UHT2.

Reliability results – live operational cartridge deployments

Faults were recorded against the exercise/device in the same manner as UHT1. Based on the classification above (categories A to E) the number of exercise attempts (UHT2 n=486) where one or more fault(s) occurred were as follows (percentage of overall exercises is shown in parenthesis):

Table 27, fault comparison UHT1 vs UHT2

	Category A Safety critical fault	Category B Major fault	Category C Identified fault	Category D Fault cleared	Category E Negligible fault/issue	No fault
T10 UHT1 	31 (4.3%)	0	13 (1.8%)	1 (0.1%)	1 (0.1%)	681 (93.7%)
T10 UHT2 	16 (3.3%)	24 (4.9%)	56 (11.5%)	4 (0.8%)	0	386 (79.4%)

Table 28 below considers a breakdown of the fault category and type. It includes where more than one fault occurred during the same exercise.

Table 28, comparison of UHT1 and UHT2 by fault category and type (colour indicates increase/decrease)

Fault category	Fault type	Frequency UHT1	Frequency UHT2
A Critical	Trigger pulled, no discharge (device detected as discharged)	24 (3.29%)	1 (0.21%)
	Single trigger pull, two probes discharged ('double-tap')	3 (0.41%)	5 (1.03%)
	CID goes blank upon firing, no discharge/ entering sleep upon arming	2 (0.27%)	8 (1.64%)
	Probe detaching, no wire visible *	2 (0.27%)	0
	Battery error during use	0	1 (0.21%)
	Wire snapped, mid-wire *	0	1 (0.21%)
	Probe jammed in magazine upon firing *	0	1 (0.21%)
Total		31 (5.21%)	17 (3.50%)
B Major	Warning tones extended past the expected timeframe	0	26 (4.93%)
Total		0	26 (4.93%)
C Identified	Wire protruding out from probe body *	2 (0.27%)	0
	Dart separated from probe body *	1 (0.14%)	0
	No warning display upon activation	2 (0.41%)	0
	CID misreading number of spent/live cartridges	5 (0.69%)	58 (11.93%)

	No CID	1 (0.14%)	0
Total		10 (1.68%)	58 (11.93%)
D Fault (cleared)	Collar lodged in chamber	0	3 (0.61%)
	Battery error	0	1 (0.21%)
Total			4 (0.82%)
E Negligible	none	0	0

*in the table above frequency is expressed as the number of exercise attempts (n=486) where such a fault occurred. However, some faults may relate only to a single probe discharge, the officer having some redundancy with other deployable cartridges available. UHT1 discharged approximately 1782 cartridges and UHT2 1188. This is particularly relevant to faults associated with probes and cartridges rather than the device. When considered in this context the actual frequency of the faults indicated * may be considerably lower.

Category A, safety critical faults UHT2

Six different types of safety critical faults were observed in the T10 system during UHT2:

- Trigger pulled, no discharge (1)
- Single trigger pull, two probes discharged (‘double-tap’) (5)
- CID goes blank upon firing, no discharge/sleep mode (8)
- Battery error during use (1)
- Wire snapping mid-wire (1)
- Probe jammed in magazine upon firing (1)

Trigger pulled, no discharge (device detected as discharged)

This fault type was the most significant critical fault during UHT1 having occurred 24 times (3.29%). During UHT2 this fault type was only observed once (0.26%). It would therefore appear the firmware update may have largely addressed this issue.

This single occurrence was with device T18 during exercise one. The officer pulled the trigger multiple times to deploy the requisite number of cartridges, with the device not deploying the six probes required. There is no obvious indication on the device log other than it deployed five probes rather than the intended six (see figure 53).

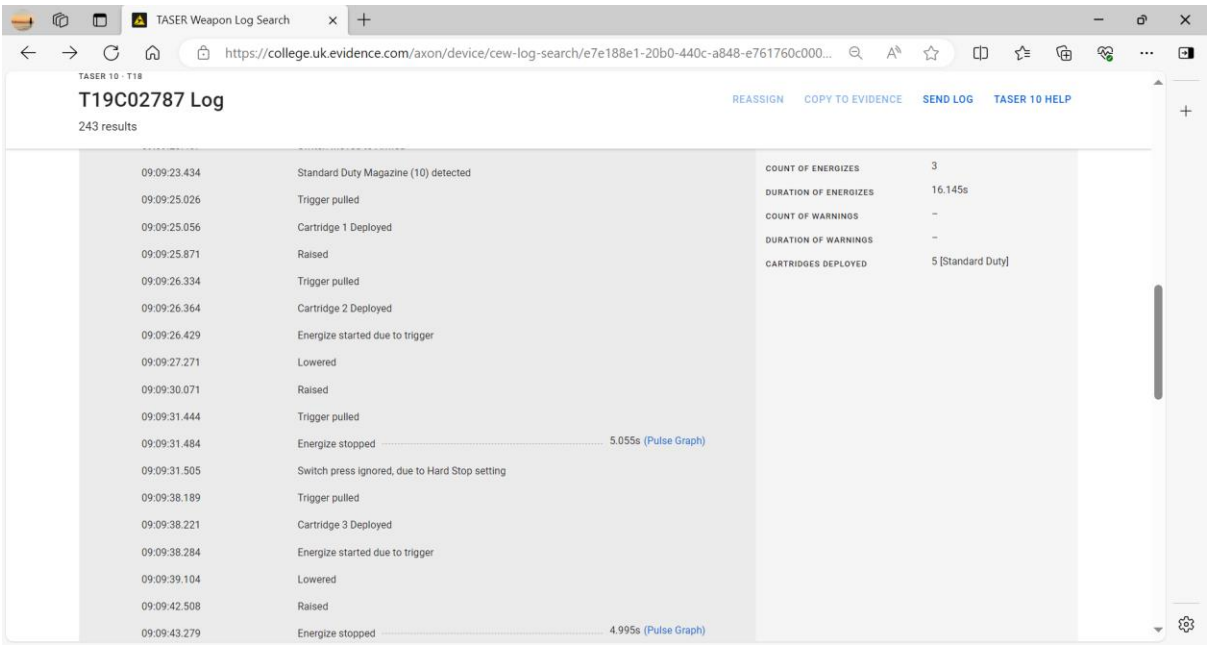


Figure 53, screen shot device log T18 exercise 1

Single trigger pull, two probes discharged (‘double-tap’)

This fault type was observed three times during UHT1 (0.41% of exercise attempts), this increased during UHT2 to five exercise attempts (1.03%). Axon did caution that in resolving the ‘trigger pull, no discharge’ issue it may lead to an increase in double discharges, but the introduction of a ‘blackout window’ may mitigate this to some degree.

Some examples of the relevant device logs are provided below. It would appear what was observed as a ‘double tap’ was recorded as a *‘Cartridge (bore#) Failed to Deploy’*. An example is shown below with device T10 during the third attempt at exercise 5 (see figure 54).

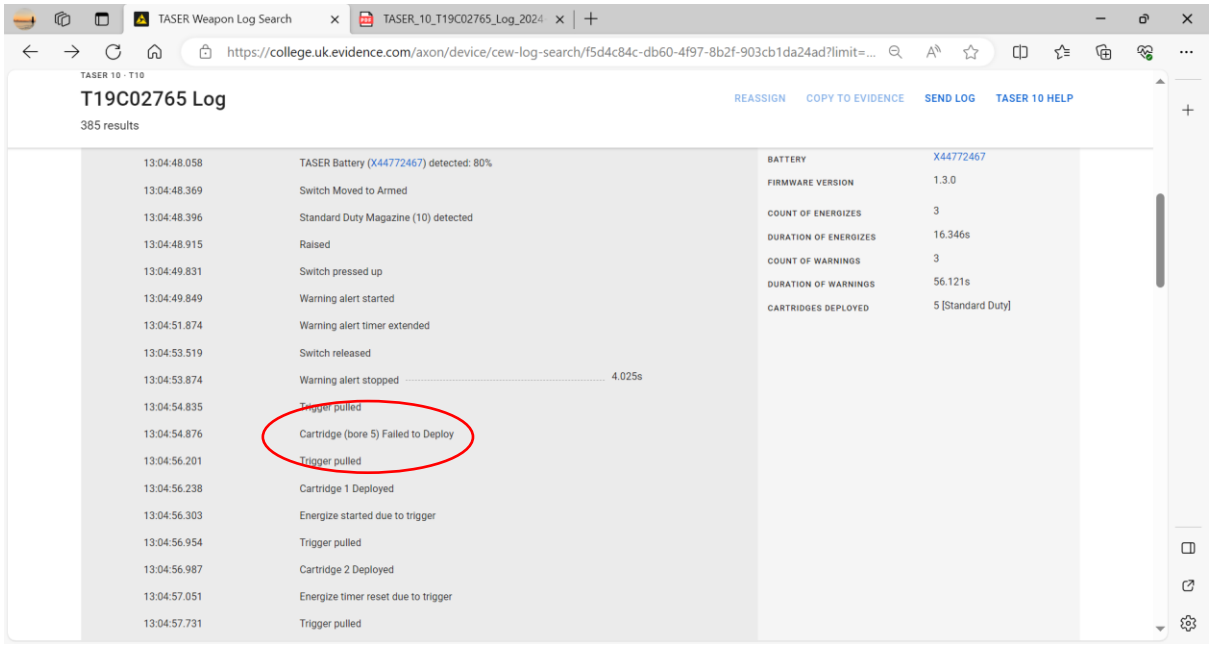


Figure 54, screenshot device log T10 exercise 5, third attempt

Device logs can also be exported from evidence.com as a PDF file. However, when the example above was exported in this fashion, the entry at 13:04:54.876 changed from *'Cartridge (bore 5) Failed to Deploy'* to *'Cartridge 1 Deployed'* (see figure 55). Both a double discharge being recorded in this fashion and two contradictory versions of the same log has obvious implications for the reliability of such evidence in a post incident enquiry.

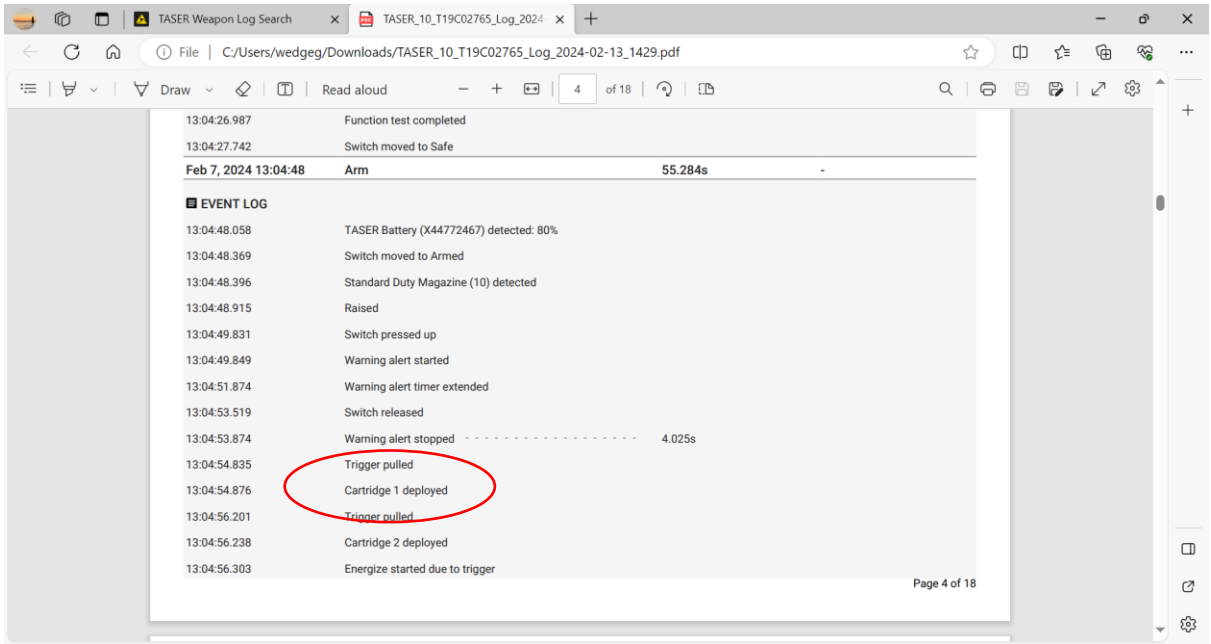


Figure 55, screenshot device log T10 exercise 5, third attempt PDF version

In addition, the total number of cartridges deployed is incorrect, showing five rather than in this case seven.

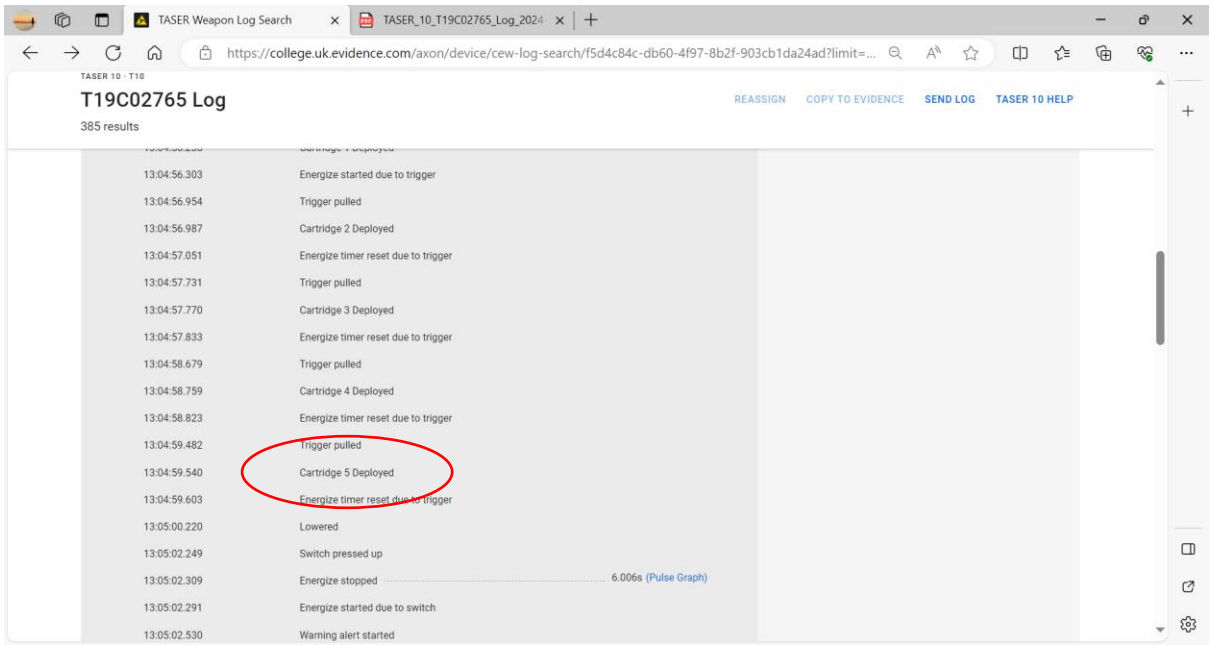


Figure 56, screenshot device log T10 exercise 5, third attempt continued

In this example the problems continued with a spurious warning tone continuing for approximately 17 seconds after the selector lever was released (see figure 57). It can be noted the device appears to reset this warning tone at exact two second intervals.

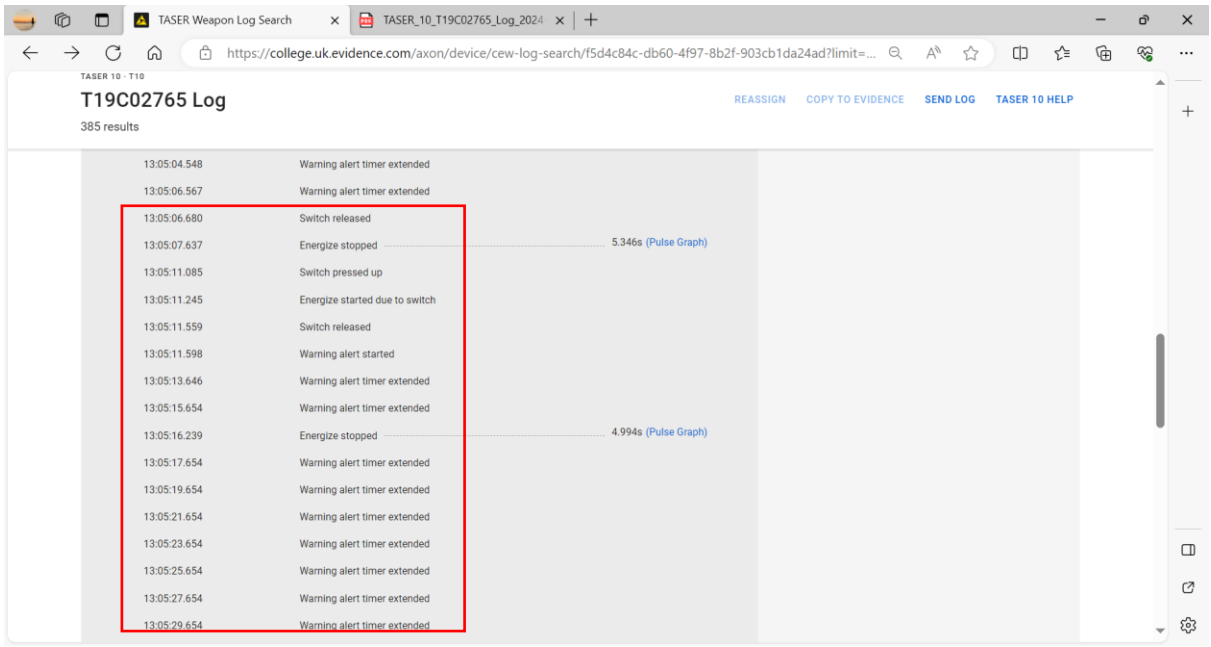


Figure 57, screenshot device log T10 exercise 5, third attempt continued

This issue is discussed further below under category B faults.

Another ‘double-tap’ occurred with device T10 during exercise 2A, again on the third attempt. The device also appears to miscount the cartridges in the magazine, incorrectly record the event as *‘Cartridge (Bore 7) Failed to Deploy’* and make the same error exporting to PDF as the previous example (see figures 58-61).

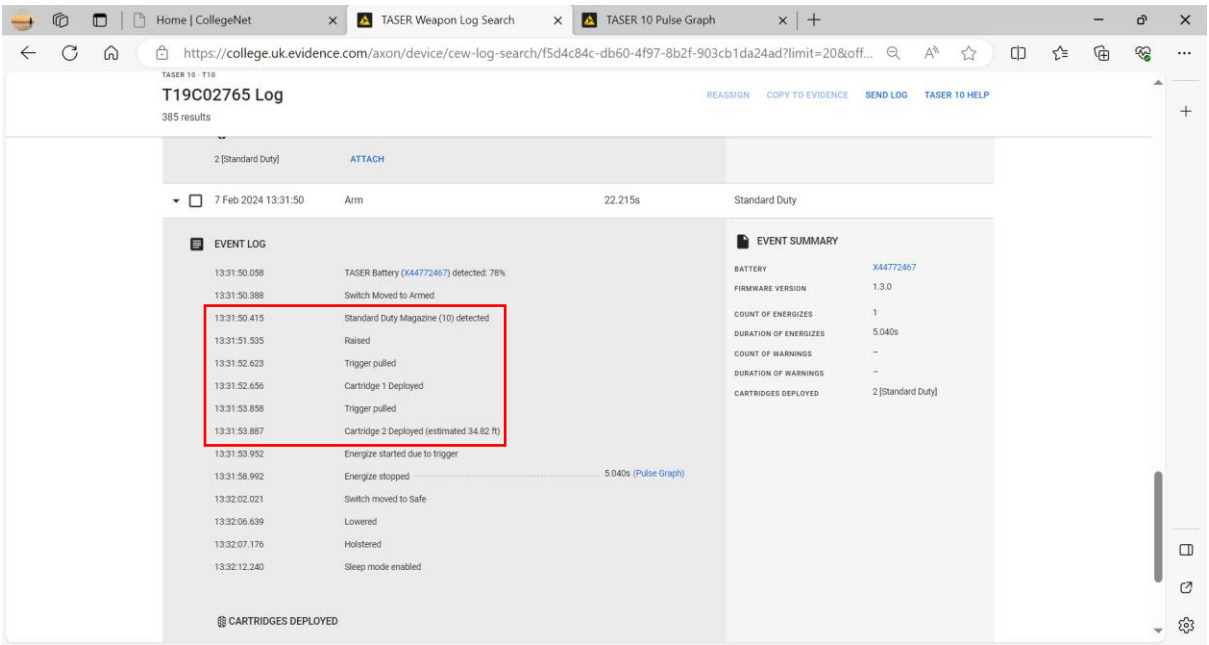


Figure 58, screenshot device log T10 exercise 2A, first attempt

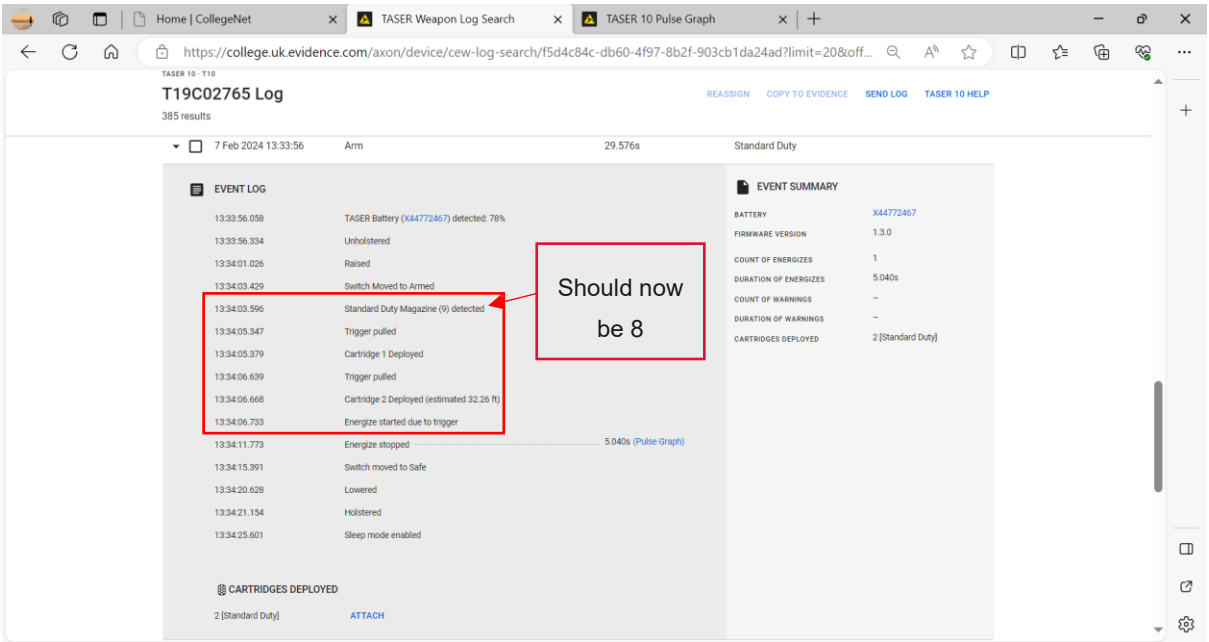


Figure 59, screenshot device log T10 exercise 2A, second attempt

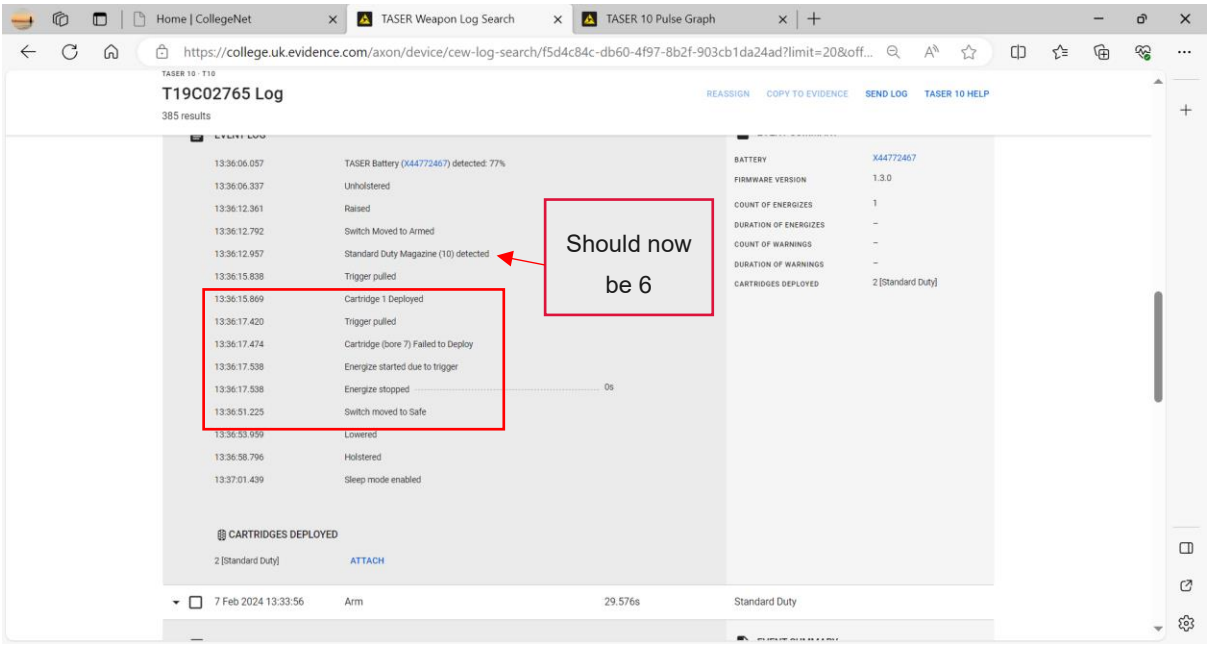


Figure 60, screenshot device log T10 exercise 2A, third attempt

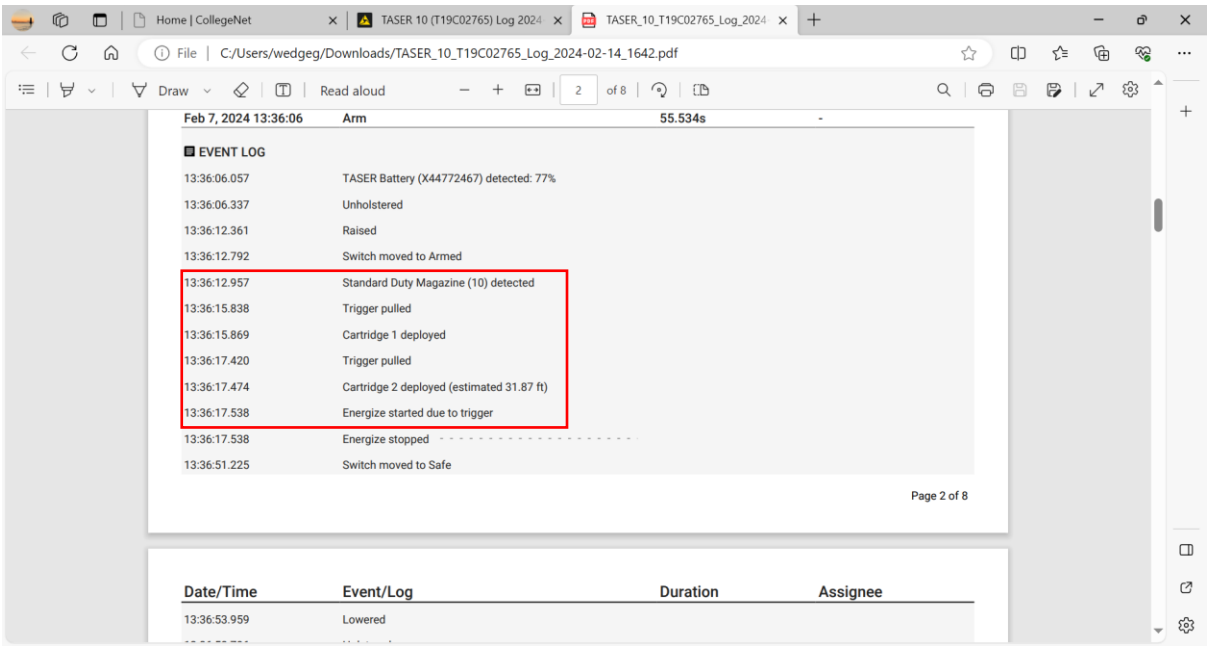


Figure 61, screenshot device log T10 exercise 2A, PDF version

Device T10, during exercise 3B, had a third occurrence of the same issue which was logged in the same fashion.

Device T17 was observed as having a double tap during exercise 5, first attempt. However, the log on this occasion recorded seven trigger pulls. The time gaps between trigger pulls varied from 0.738s to the lowest 0.273s (see figure 62).

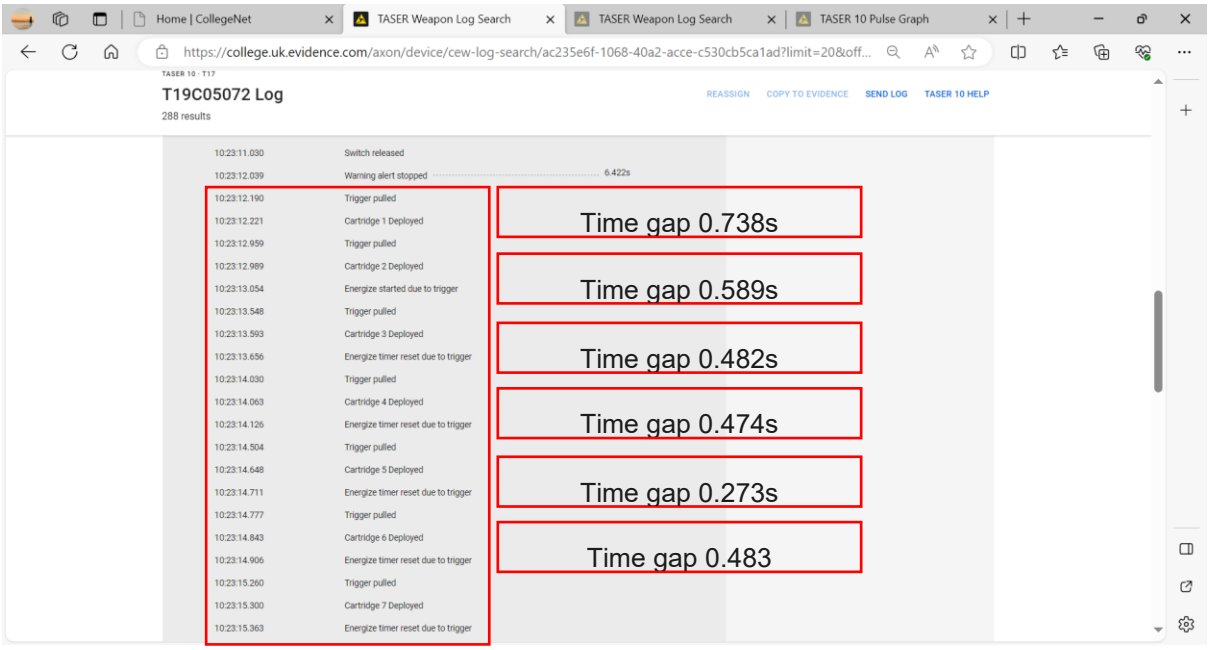


Figure 62, screenshot device log T17 exercise 5, first attempt

It is conceivable, that this is operator error. Previous examples observed in UHT1 were all sub 200 milliseconds.

CID goes blank upon firing, no discharge/ entering sleep mode

This type of fault occurred eight times (1.64%) during UHT2, although the exact symptoms of how it manifested itself varied somewhat.

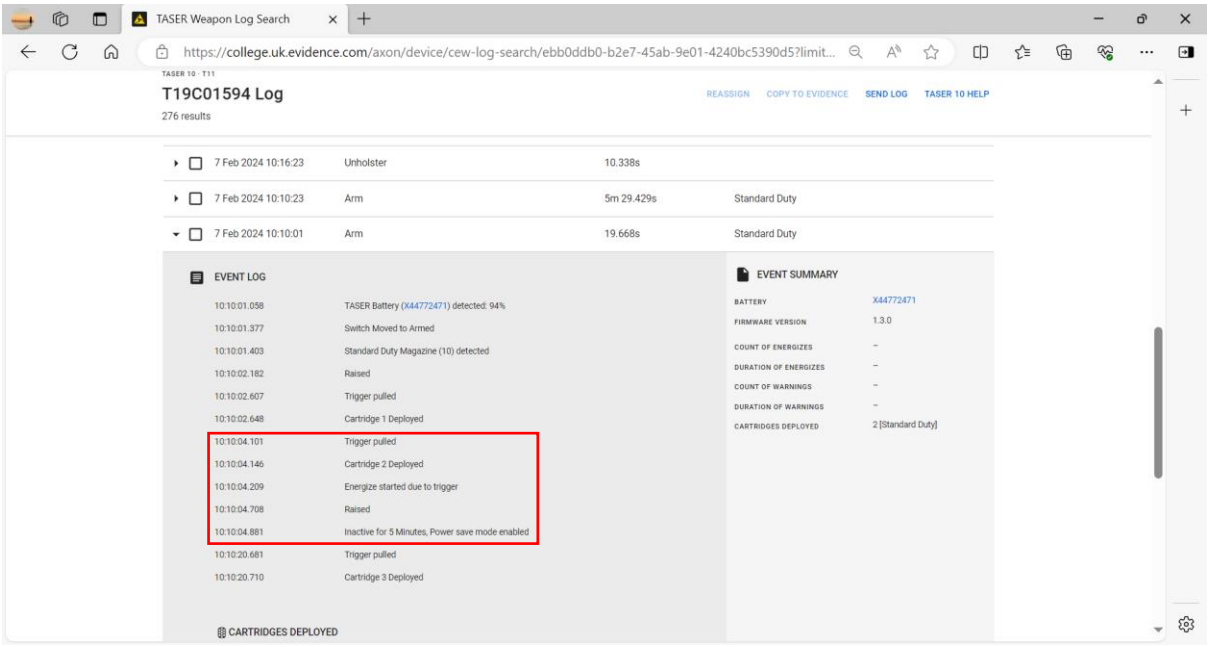


Figure 63, screenshot device log T11 exercise 1, first attempt

Device T11 during exercise one exhibited two cartridge bay errors and powered down during the exercise. The event log is shown in figure 63. It can be seen at 10:10:04.881 the event log states *'Inactive for 5 minutes. Power save mode enabled.'* This is despite the trigger being pulled, and cartridge deployed, less than a second earlier.

During the first attempt of exercise five, device T14 failed to fire on the second shot and the CID went blank. However, the device event log appears completely normal other than it was misreading a full magazine of ten as nine.

During the first attempt of exercise four device T16 shut down and failed to fire. On the device log it can be seen that the device enables sleep mode 0.170s after it has been armed (see figure 64).

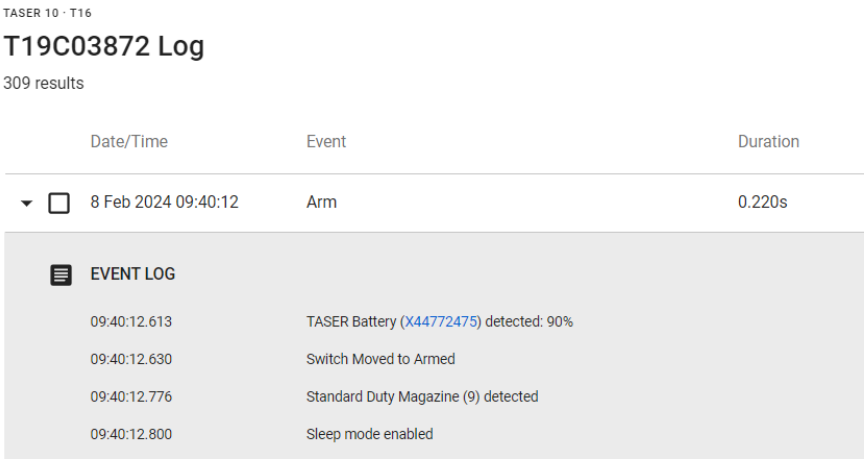


Figure 64, screenshot device log T16 exercise 4

The same issue occurred to this device during exercise 2A and was logged the same way, again enabling sleep mode 0.169s after being armed.

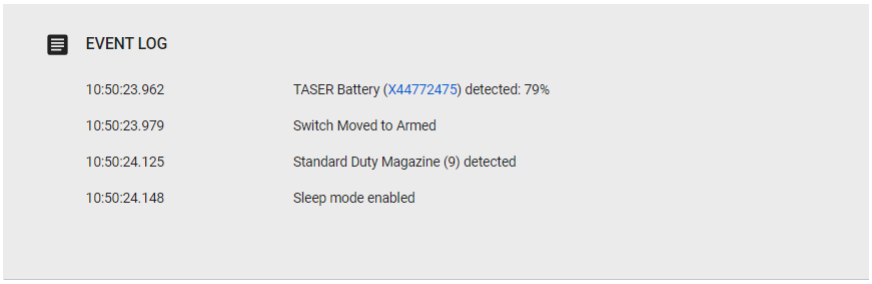


Figure 65, screenshot device log T16 exercise 2A

An issue also occurred to device T18 during exercise four where the officer described arming the device and nothing happening, the CID, sidelight, laser, torch all failed to operate. They holstered the device and tried again, where upon it worked correctly. The device logged the function check immediately prior, and the officer's subsequent action to try and get a response from the device (possibly by trying to function check, hence pressing the switch down, see figure 66) but essentially the device appeared 'dead'.

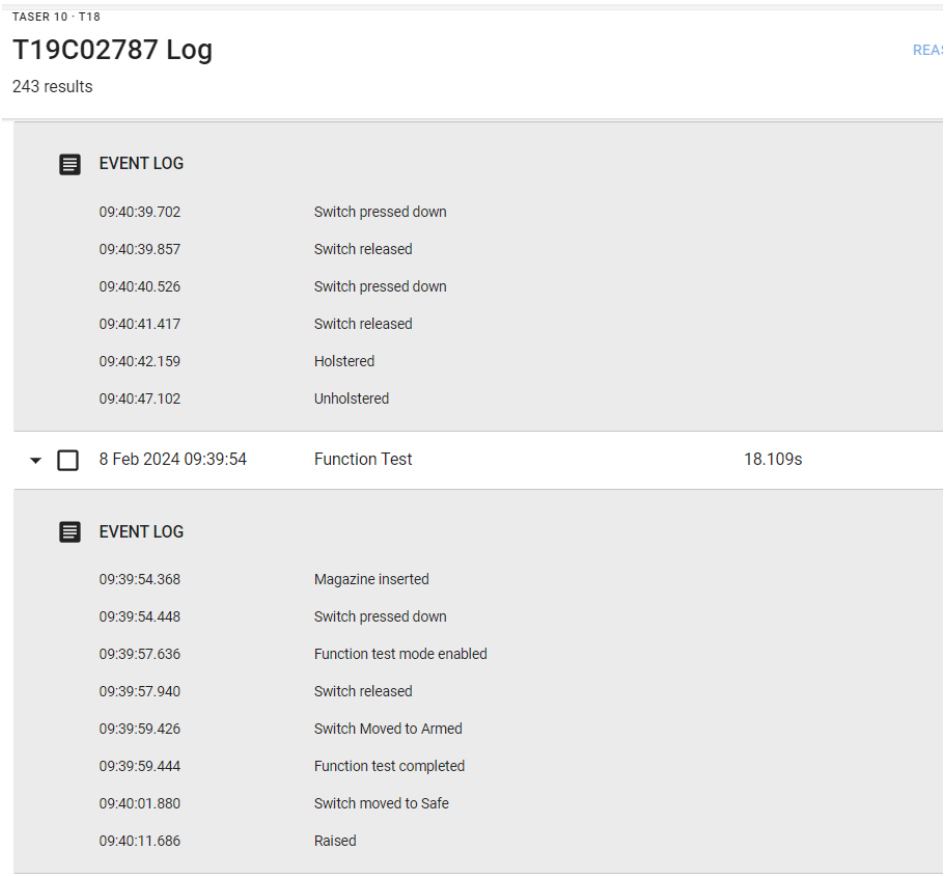


Figure 66, screenshot device log T18 exercise 4

Device T20 during the third attempt of exercise five also shut down during the attempt. Again, the device log shows it entering sleep mode 0.169s after being armed.

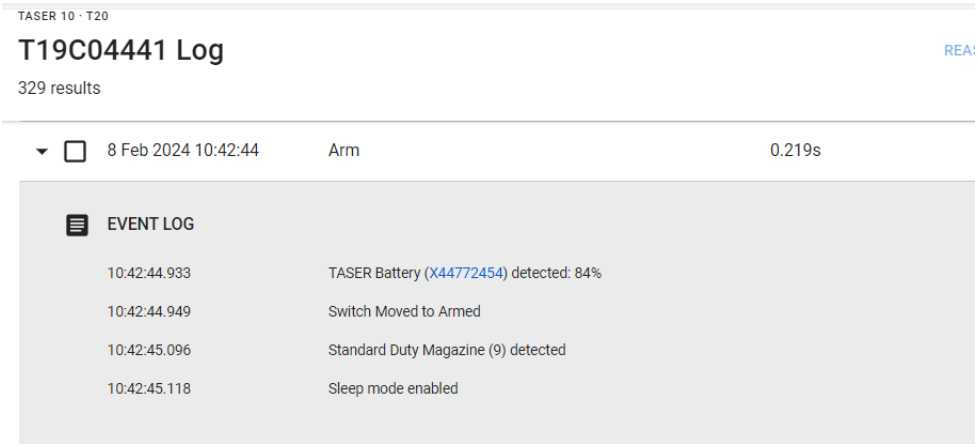


Figure 67, screenshot device log T20 exercise 5

Two devices, T6 and T7, both powered off and entered sleep mode upon being armed during the first attempt of exercise 2. As can be seen in the extract of the

event log for T6 (see figure 68) the device entered sleep mode approximately two tenths of a second after being armed.

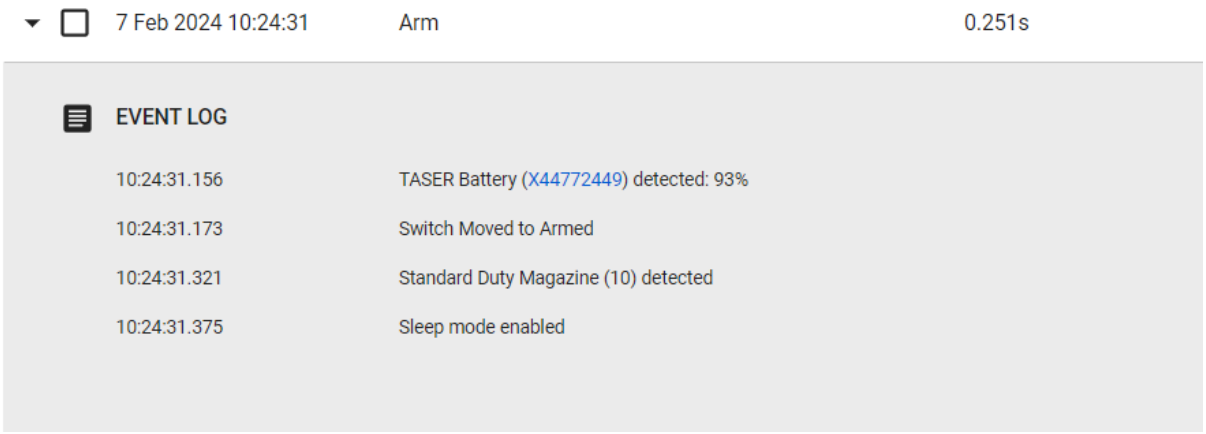


Figure 68, screenshot device log T6 exercise 2

Similarly, device T7 exhibited the same issue (see figure 69).

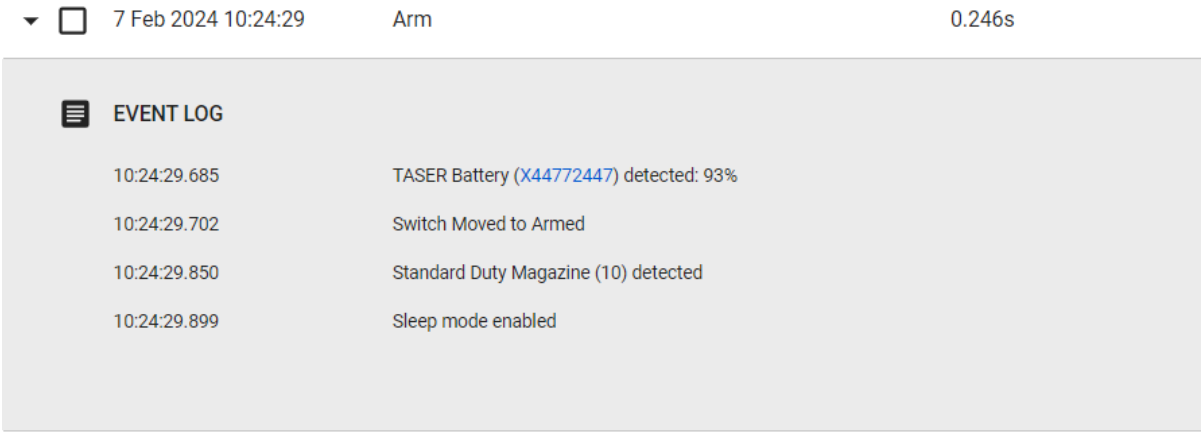


Figure 69, screenshot device log T7 exercise 2

Clearly the device is inoperative in sleep mode and requires the officer to manipulate the selector switch from the armed to safe position, and back to armed. However, this assumes they understand immediately what has happened and the requisite corrective action required.

Battery error during use

During the first attempt of exercise 2, having been successfully function checked, device T11 displayed a battery error (battery B11). The battery was replaced with battery B19 and the device than performed reasonably well for the remainder of the trial only exhibiting CID misreads after this event. However, this battery was not

captured as a ‘battery inserted’ device log entry upon being replaced, but the battery serial number is correctly displayed in each log entry.

Device T11 was subject to a CID going blank and failing to fire in exercise 1, as described above. In addition, when the first attempt was made to dock the battery to upload the log to evidence.com the device was showing as having a critical error, requiring RMA (‘return merchandise authorisation’, used by Axon to indicate a product should be returned). This critical error disappeared from evidence.com, but it was of note the firmware reverted to version 0.0.0 (see figure 71), despite the log showing the device was updated to firmware 1.3.0 on 6th Feb 2024 (see figure 70).

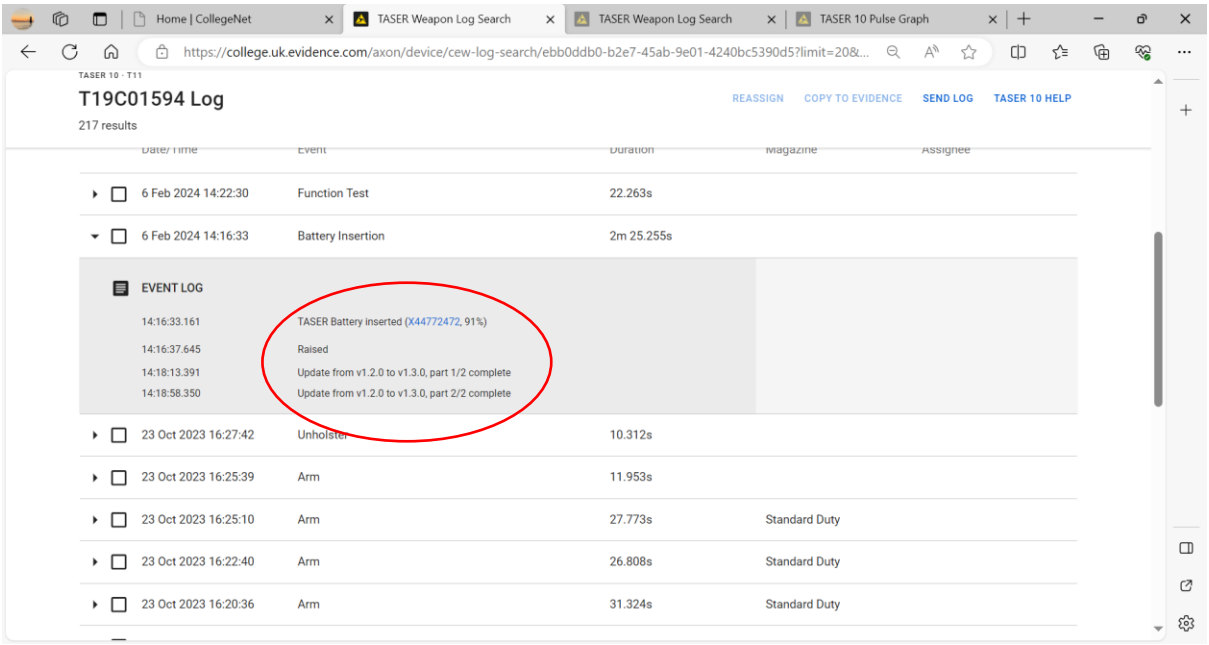


Figure 70, screenshot device log T11

All batteries were docked at the end of the trial on 7th February 2024, and the device does detect a last function test at 11:03hrs on 7th February 2024 but curiously shows its last upload the day before (see figure 71). Logging a function check after its last download seems somewhat of a paradox, but the log shows it did download but has been corrupted somehow. It is possible a ‘log sync error’ has occurred, which is relatively easy to resolve, requiring a battery to be refitted and docked again.

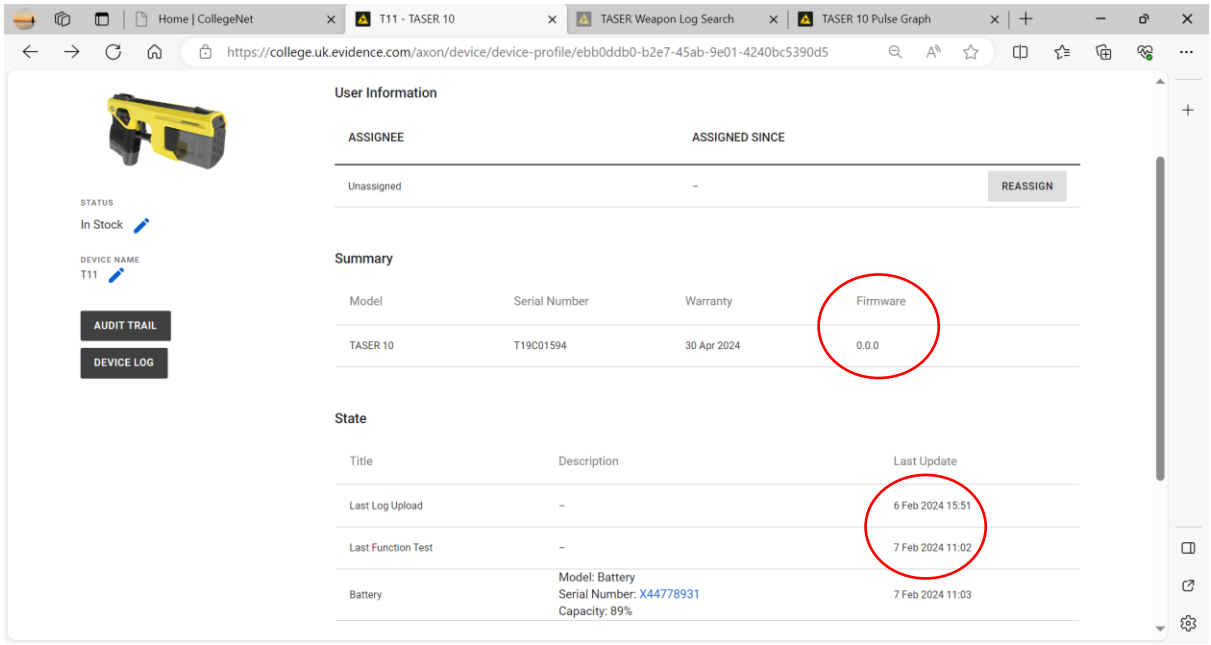


Figure 71, screenshot device log T11

Wire snapping mid-wire

During the second attempt of exercise 3B, device T8 fired a probe and the wire snapped approximately midway along its length. This was fired from either chamber 1 or 2 indicated in figure 72 below.

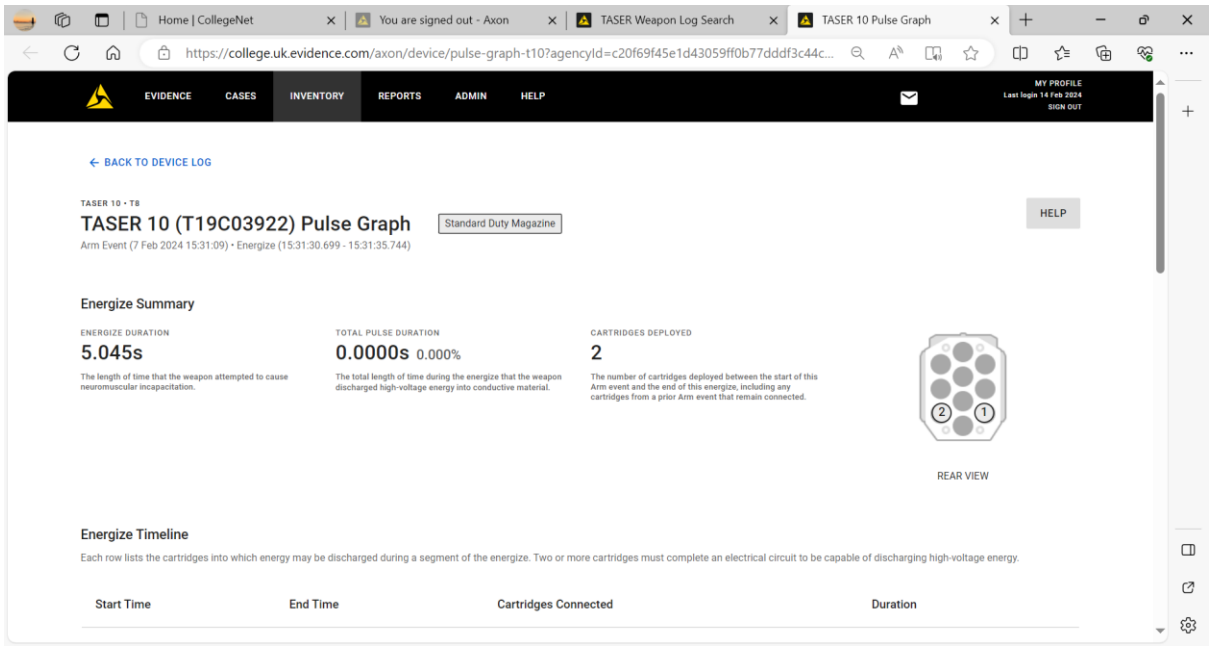


Figure 72, screen shot of pulse graph for device T8

Whilst an officer in these circumstances would have the redundancy of further probes, clearly where a wire snaps it cannot create NMI.

Probe jammed in magazine upon firing

During the first attempt of exercise 3B, device T8 fired its first probe but it became jammed in the magazine. Indeed, it would appear the device attempted to discharge the whole cartridge assembly through the bore (see figures 73 and 74).

Figure 73, misfired cartridge

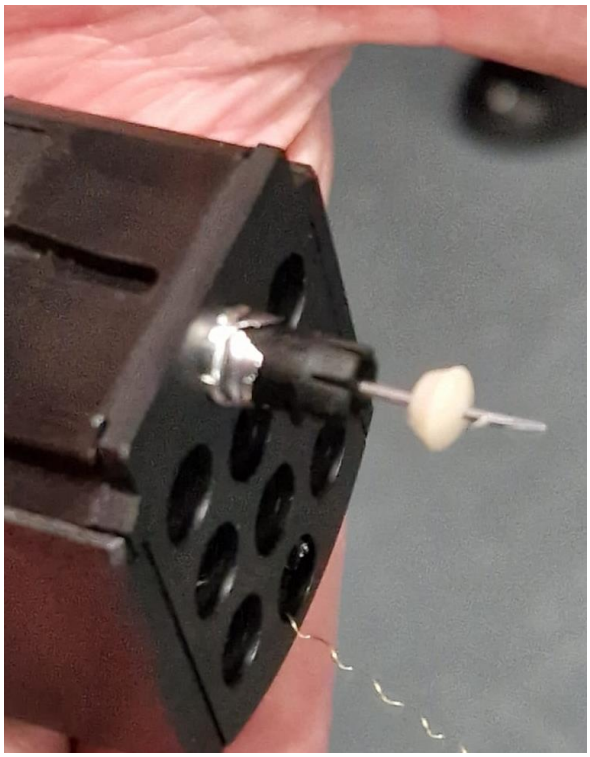


Figure 74, misfired cartridge front view of magazine

Upon removing the magazine, it was apparent the shoulder of the cartridge had not been restrained by the chamber and discharged the whole assembly into the bore of the magazine, where it had jammed.

Figure 76, misfired cartridge rear view of magazine

Figure 75, misfire cartridge removed from magazine

The cartridge was removed from the magazine, and the magazine was examined. There was no apparent damage, to the naked eye, to the chamber or bore that could cause such a malfunction. This was the only incidence of this malfunction that occurred during both UHT1 and UHT2, where a total of approximately 2970 cartridges were discharged. Including development work and training, the authors have been involved with the discharge of approximately 3293 T10 cartridges by this stage. This is the first time this type of fault has been observed.

Noting this was the same device and magazine that experienced a snapped wire in the next attempt of this exercise (see above) the device log was examined. It is apparent that different chambers within the magazine were used for this attempt and there does not appear to be any obvious association. However, it is worthy of note

that of the six probes deployed by device T8 during exercise 3B, two failed to deploy correctly.

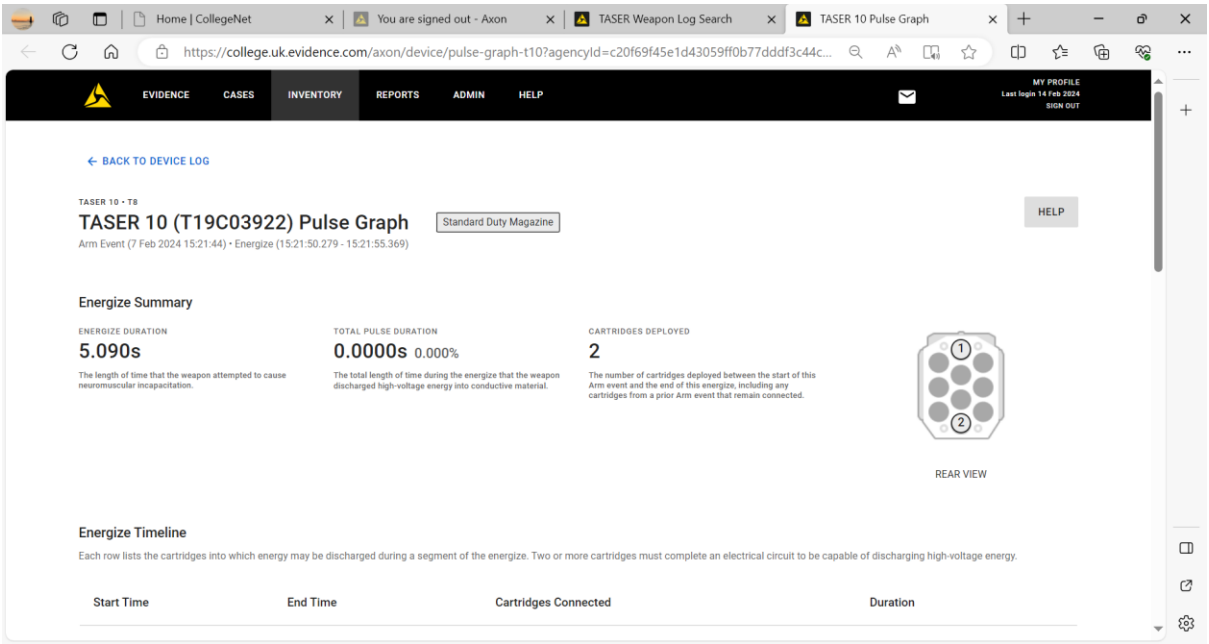


Figure 77, screenshot of pulse graph for device T8

Category B, major faults UHT2

Warning tones extended past the expected timeframe

During UHT2, on 24 (4.94%) occasions, a device exhibited a spurious audio tone at the end of the exercise attempt, in that it continued beyond the expected time frame. This was either a connection alert or warning alert. Curiously this was not observed at all during UHT1 where devices were operating on firmware 1.2.0.

The Axon circular (appendix 2) that supported the introduction of firmware 1.3.0, which the devices operated on during UHT2, stated the following:

> **3) Addressed issue with sounds (Warning Alert or Connection Alert) extending passed expected timeframe**
>
> - Axon received isolated reports of the Warning Alert or Connection Alert sound persisting even after a TASER 10 selector switch was no longer in the tap up position. In some cases, the sound did not stop despite a lost connection. This condition has been improved in firmware 1.3.0.
> - In rare occurrences the sound will continue to persist. Axon intends to release a new firmware update to fully resolve this issue by the end of January.

Clearly the authors can only base their conclusions on UHT1 and UHT2, but this issue would appear to have got worse rather than better. The bulletin does allude to

a further firmware update in January 24, but at the time of UHT2 (February 24) this had not been released.

Category C, identified faults UHT2

Only one fault type was noted that falls into this category, the CID misreading the number of live/spent cartridges. During UHT1 only five events of CIDs misreading the number of live/spent cartridges were noted. During UHT2 this increased to 58 (11.93%). It also occurred alongside other faults described above. Often this misreading will translate to the device log too, meaning it is incorrect, with all the implications this has for post incident investigation. This is of particular concern as it could undermine an officer's legitimate testimony as it relates to use of force with a spurious event log.

Category D, identified faults (cleared) UHT2

During UHT2 two types of fault were observed that fall into this category:

- Collar lodged in magazine chamber (3)
- Battery error (1)

Collar lodged in magazine chamber

On three occasions (0.62%) during UHT2, a collar from the cartridge remained lodged in the magazine upon unloading. Whilst this was observed with HALT cartridges, it was not seen with the live operational cartridges in UHT1. On all three occasions it was noted and removed. The potential worst-case scenario with such a phenomenon is the officer not noticing it and attempting to reload a cartridge. To understand the implications an attempt was made to load another cartridge with a collar lodged in the magazine. It was not possible in this test to load another cartridge, it simply jammed before the cartridge could reach the correct position.

During loading, a cartridge was found fitted with two collars (see figure 78). It is not possible to verify whether it was supplied in this fashion, or it had been partially loaded into a magazine with an embedded collar, which threaded on to the cartridge,

and unloaded. Whilst the latter is unlikely, again to understand the potential consequences in an operational or training setting, an attempt was made to load it into a magazine. It was not possible to apply enough pressure to the cartridge for it to be loaded, despite considerable force being deliberately applied. One could conclude if a cartridge, for whatever reason, was fitted with two collars it is almost impossible to load it, and certainly impossible to do so accidentally.

Figure 78, cartridge with two collars

One could also contend that this issue is unlikely to affect operational deployment as the charging of a magazine is essentially a one-off administrative process, whereas in training it will occur on multiple occasions. Therefore, the simple expedient of making instructors aware of this issue of dislodged collars should suffice. (See also key finding 14 as it relates to HALT cartridges).

Battery error

During handling prior to exercise 1 device T4 showed a battery error. This was resolved by the user by refitting the battery in accordance with trouble shooting practices. This was possibly caused by user error, and it did not occur again.

Accuracy UHT2

As outlined above this second user handling trial was predominantly focused on reliability rather than other attributes such as accuracy. Data was recorded in relation to accuracy of the T10, which was broadly consistent with the original user handling trial and is summarised in table 29 below.

Table 29, comparison of data UHT1 vs UHT2 (T10 only)

		UHT1 mean POA-POI	UHT2 mean POA-POI
Exercise 1 3m laser sight	Top	29mm	29mm
	Bottom	28mm	27mm
Exercise 2 5m laser sight	Top	44mm	47mm
	Bottom	44mm	42mm
Exercise 2A 10m laser sight	Top	81mm	93mm
	Bottom	80mm	91mm
Exercise 2B 13.7m laser sight	Top	123mm	138mm
	Bottom	130mm	157mm
Exercise 3 5m fixed sight	Top	76mm	73mm
	Bottom	46mm	44mm
Exercise 3A 10m fixed sight	Top	145mm	130mm
	Bottom	85mm	88mm
Exercise 3B 13.7m fixed sight	Top	173mm	204mm
	Bottom	143mm	148mm

Exercise 4 **3m laser sight**	Left	29mm	25mm
	Right	26mm	27mm
Exercise 5 **3m laser sight multiple targets**	Top	33mm	29mm
	Bottom	33mm	29mm
	Time	5.5s	5.4s
Mean battery loss		20%	20%

In addition, the percentage of shots that fell within the most accurate 95% of shots from UHT1 is summarised in table 30 below.

Table 30, percentage of shots during UHT2 that are within the 95 percentile of UHT1

Exercise 1	<60mm	Top	94.3%
		Bottom	94.3%
Exercise 2	<85mm	Top	96.3%
		Bottom	94.4%
Exercise 2A	<190mm	Top	83.3%
		Bottom	87.0%
Exercise 2B	<230mm	Top	83.3%
		Bottom	87.0%
Exercise 3	<195mm	Top	100%
		Bottom	100%
Exercise 3A	<360mm	Top	92.3%

		Bottom	100%
Exercise 3B	<310mm	Top	92.3%
		Bottom	100%
Exercise 4	<60mm	Left	98.1%
		Right	98.1%
Exercise 5	<70mm	Top	95.7%
		Bottom	98.8%

One could conclude the devices remained accurate consistent with the findings of UHT1.

User handling trial 3 (UHT3)

As a result of UHT2 the findings were again discussed with Axon via the project lead and Home Office.

Axon suggested most of the issues still apparent during UHT2 would largely be resolved by an update to the device itself (known as revision B devices) and a further firmware update (version 1.4.9).

To that end a further user handling trial was conducted (2nd/3rd April 2024) using 20 new revision B Taser 10 CEDs (labelled C1 to C20) and 20 new revision A magazines (labelled N1 to N20). In addition, the new devices were all operating on firmware version 1.4.9. This was preloaded by Axon onto the devices ahead of its scheduled launch on 8th April 2024.

As with the previous firmware updates, this was accompanied by an Axon training bulletin (see **appendix 3**).

This third user handling trial (UHT3) was conducted as follows:

- all T10 devices replaced with revision B devices, updated to firmware version 1.4.9
- all devices cleaned and inspected prior to delivery by Axon
- trial conducted largely as per first/second trial, recognising test of reliability only
- trial conducted by T10 instructors to eliminate training phase
- six instructors (four participants, two safety officers/observers), exercises completed in groups of four (as per original trial, maintaining same pace and rhythm)
- each participant allocated three devices, exercise 1 with first device, then exercise 1 second device, third device etc (maintaining same order and tempo of original user handling trial)
- trial exercises conducted as per original plan, removing exercises 6 and 7 (as they are HALT exercises and not part of the operational system)

Gather data on:

- reliability (faults recorded as per original categorisation)

Figure 79, 12 of the T10 devices prior to UHT3

No accuracy data was recorded although they were monitored for any spurious performance.

An engineer from Axon was available during UHT3 to investigate any issues as they occurred but was generally not present during the exercises themselves or allowed to influence the trial in any way. They did download engineering logs at the end of the trial.

Reliability results (UHT3) – live operational cartridge deployments

Faults were recorded against the exercise/device in the same manner as UHT1 and UHT2. Based on the classification above (categories A to E) the number of exercise attempts (UHT3 n=537, note one device 'missed' one exercise whilst an issue was resolved) where one or more fault(s) occurred were as follows (see table 31 below, percentage of overall exercises is shown in parenthesis):

Table 31, fault comparison of UHT1, UHT2 and UHT3

	Category A Safety critical fault	Category B Major fault	Category C Identified fault	Category D Fault cleared	Category E Negligible fault/issue	No fault
T10 UHT1 n=727	31 (4.3%)	0	13 (1.8%)	1 (0.1%)	1 (0.1%)	681 (93.7%)
T10 UHT2 n=486	↓16 (3.3%)	↑ 24 (4.9%)	↑ 56 (11.5%)	↑ 4 (0.8%)	0	↑ 386 (79.4%)
T10 UHT3 n=537	↓ 10 (1.9%)	↓ 15 (2.8%)	↓ 9 (1.7%)	↓ 4 (0.7%)	0	↓ 499 (92.9%)

Table 32 below considers a breakdown of the fault category and type. Faults have been categorised further as follows:

- A1 Trigger pulled, no discharge
- A2 Single trigger pull, two probes discharged
- A3 CID goes blank upon firing, no discharge
- A4 Probe detaching, no wire visible
- A5 Battery error during use
- A6 Wire snapped mid wire
- A7 Probe jammed in magazine upon firing
- B1 Cartridge bay errors
- B2 Warning tones extended past the expected timeframe
- C1 Wire protruding out from probe body
- C2 Dart separated from probe body
- C3 No warning display upon activation

- C4 CID misreading number of spent/live cartridges
- C5 No CID
- D1 CID misreading the number cartridges upon loading
- D2 unresponsive device upon function checking

It includes where more than one fault occurred during the same exercise. Care needs to be applied when considering more than one fault during the same exercise as often they can be related or two symptoms of the same fault. For example, a cartridge that fails to fire and a cartridge bay error on the CID are not necessarily two faults, as the latter issue is the device identifying the problem with the failed cartridge. Equally an unresolved fault can translate to the following exercise which can also result in double counting. Where identified as such, double counting was been excluded from the data presented in table 31 above.

Table 32, comparison of UHT1, UHT2 and UHT3 by fault category and type (colour indicates increase/decrease)

Fault category	Fault type	Frequency UHT1	Frequency UHT2	Frequency UHT3
A Critical	(A1) Trigger pulled, no discharge	24 (3.3%)	1 (0.2%)	6 (1.1%)
	(A2) Single trigger pull, two probes discharged (‘double-tap’)	3 (0.4%)	5 (1.0%)	0
	(A3) CID goes blank upon firing, no discharge/ entering sleep upon arming	2 (0.3%)	8 (1.6%)	0
	(A4) Probe detaching, no wire visible	2 (0.3%)	0	2 (0.4%)
	(A5) Battery error during use	0	1 (0.2%)	0

	(A6) Wire snapped, mid-wire	0	1 (0.2%)	2 (0.4%)
	Probe jammed in magazine upon firing	0	1 (0.2%)	0
Total		31 (5.2%)	17 (3.5%)	10 (1.9%)
B Major	(B2) Warning tones extended past the expected timeframe	0	26 (4.9%)	11 (2.0%)
	(B1) Cartridge bay errors	0	0	4 (0.8%)
Total		0	26 (4.9%)	14 (2.6%)
C Identified	(C1) Wire protruding out from probe body	2 (0.27%)	0	0
	(C2) Dart separated from probe body	1 (0.14%)	0	0
	(C3) No warning display upon activation	2 (0.41%)	0	0
	(C4) CID misreading number of spent/live cartridges	5 (0.7%)	58 (11.9%)	(1.7%)
	(C5) No CID	1 (0.1%)	0	0
Total		10 (1.7%)	58 (11.9%)	10 (1.9%)

A full break down of the fault type, the device and exercise in which it occurred are provided in **appendix 4**.

Category A, safety critical faults UHT3

Category A faults by their very definition are the most serious faults, where the device has failed to deploy. As can be seen from table 33 UHT3 continued the trend

Table 33, comparison of category A faults during UHT1, UHT2 and UHT3 (colour indicates increase/decrease)

Fault category	Fault type	Frequency UHT1	Frequency UHT2	Frequency UHT3
A Critical	(A1) Trigger pulled, no discharge	24 (3.3%)	1 (0.2%)	6 (1.1%)
	(A2) Single trigger pull, two probes discharged ('double-tap')	3 (0.4%)	5 (1.0%)	0
	(A3) CID goes blank upon firing, no discharge/ entering sleep upon arming	2 (0.3%)	8 (1.6%)	0
	(A4) Probe detaching, no wire visible	2 (0.3%)	0	2 (0.4%)
	(A5) Battery error during use	0	1 (0.2%)	0
	(A6) Wire snapped, mid-wire	0	1 (0.2%)	2 (0.4%)
	Probe jammed in magazine upon firing	0	1 (0.2%)	0
Total		31 (5.2%)	17 (3.5%)	10 (1.9%)

observed in UHT2 with a reduction overall in Category A faults. In the event of such a fault the Taser 10 system has significant redundancy, in comparison with two shot extant devices, with up to nine further probes available. Of the ten (1.9%) category A faults observed in UHT3, with the exception of two devices/exercise attempts (2:537

or 0.4%), the officer could continue to deploy probes, i.e. they could work round the issue.

Trigger pulled, no discharge (A1)

This fault occurred during 24 exercise attempts (3.3%) during UHT1, reduced to one exercise attempts during UHT2 and was observed during six exercise attempts (1.1%) during UHT3.

During these six exercise attempts in UHT3, in four of them the officer could continue to deploy probes, mitigating the impact of the fault to a large degree. On two occasions (devices C5 and C8) the fault rendered the device unresponsive. Eventually, the simple expedient of removing the battery and refitting it essentially 'reset' the devices and they continued to work consistently for the remaining exercises. Clearly such remedial action would be limited to appropriate circumstances such as a training environment or troubleshooting by a technician for example. It is highly unlikely such action would be appropriate during an operational deployment.

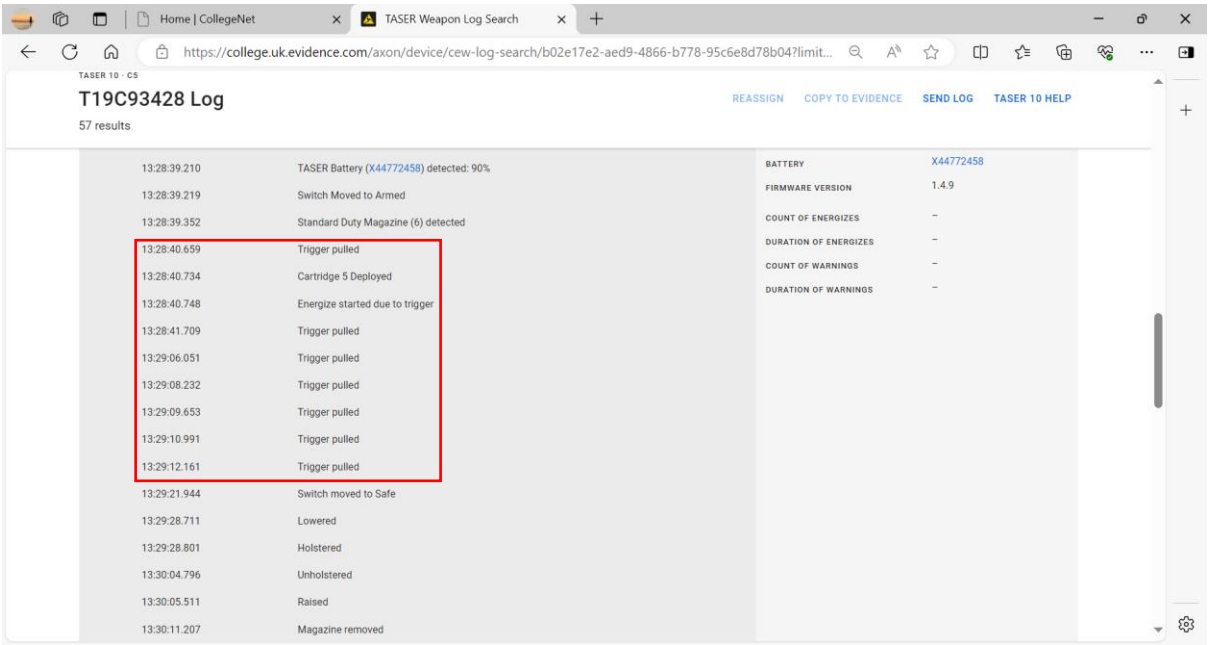


Figure 80, screenshot device log C5 exercise 3, third attempt

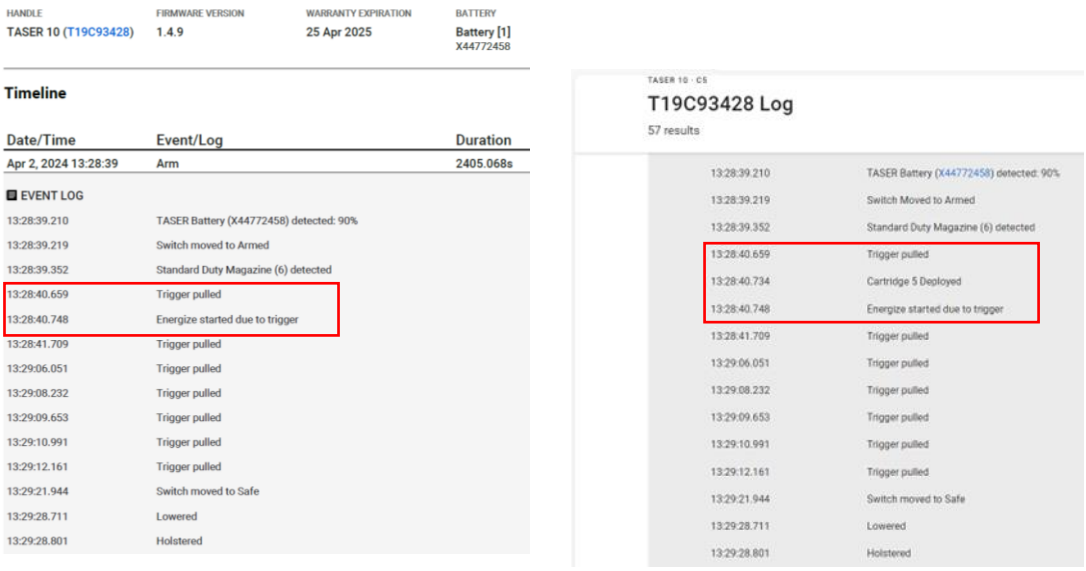
The device log was examined for device C5 during exercise 3. As can be seen from figure 80 above the device appears to detect the remaining six cartridges normally, deploys the first cartridge normally (13:28:40.734 Cartridge 5 deployed). It then

registers six further attempts to pull the trigger without deploying a cartridge. In addition, the CID was ‘frozen’ displaying the figure one. (See figure 81)

Figure 81, Device C5 during exercise 3 with 'frozen' CID

The event log can also be exported from evidence.com in PDF document format.

When the PDF version is examined, it appears different in one respect to the original version.



HANDLE	FIRMWARE VERSION	WARRANTY EXPIRATION	BATTERY
TASER 10 (T19C93428)	1.4.9	25 Apr 2025	Battery [1] X44772458

Timeline

Date/Time	Event/Log	Duration
Apr 2, 2024 13:28:39	Arm	2405.068s
EVENT LOG		
13:28:39.210	TASER Battery (X44772458) detected: 90%	
13:28:39.219	Switch moved to Armed	
13:28:39.352	Standard Duty Magazine (6) detected	
13:28:40.659	Trigger pulled	
13:28:40.748	Energize started due to trigger	
13:28:41.709	Trigger pulled	
13:29:06.051	Trigger pulled	
13:29:08.232	Trigger pulled	
13:29:09.653	Trigger pulled	
13:29:10.991	Trigger pulled	
13:29:12.161	Trigger pulled	
13:29:21.944	Switch moved to Safe	
13:29:28.711	Lowered	
13:29:28.801	Holstered	

TASER 10 · C5

T19C93428 Log

57 results

13:28:39.210	TASER Battery (X44772458) detected: 90%
13:28:39.219	Switch Moved to Armed
13:28:39.352	Standard Duty Magazine (6) detected
13:28:40.659	Trigger pulled
13:28:40.734	Cartridge 5 Deployed
13:28:40.748	Energize started due to trigger
13:28:41.709	Trigger pulled
13:29:06.051	Trigger pulled
13:29:08.232	Trigger pulled
13:29:09.653	Trigger pulled
13:29:10.991	Trigger pulled
13:29:12.161	Trigger pulled
13:29:21.944	Switch moved to Safe
13:29:28.711	Lowered
13:29:28.801	Holstered

Figure 82, screenshot device log C5 exercise 3, third attempt comparison of original log vs pdf version

In figure 82 above the PDF version on the left does not show the deployment of cartridge 5 at 13:28:40.734, unlike the evidence.com version on the right. It would appear the issue of exporting accurate PDF copies of device logs remains unresolved at this juncture, although it does appear to have improved.

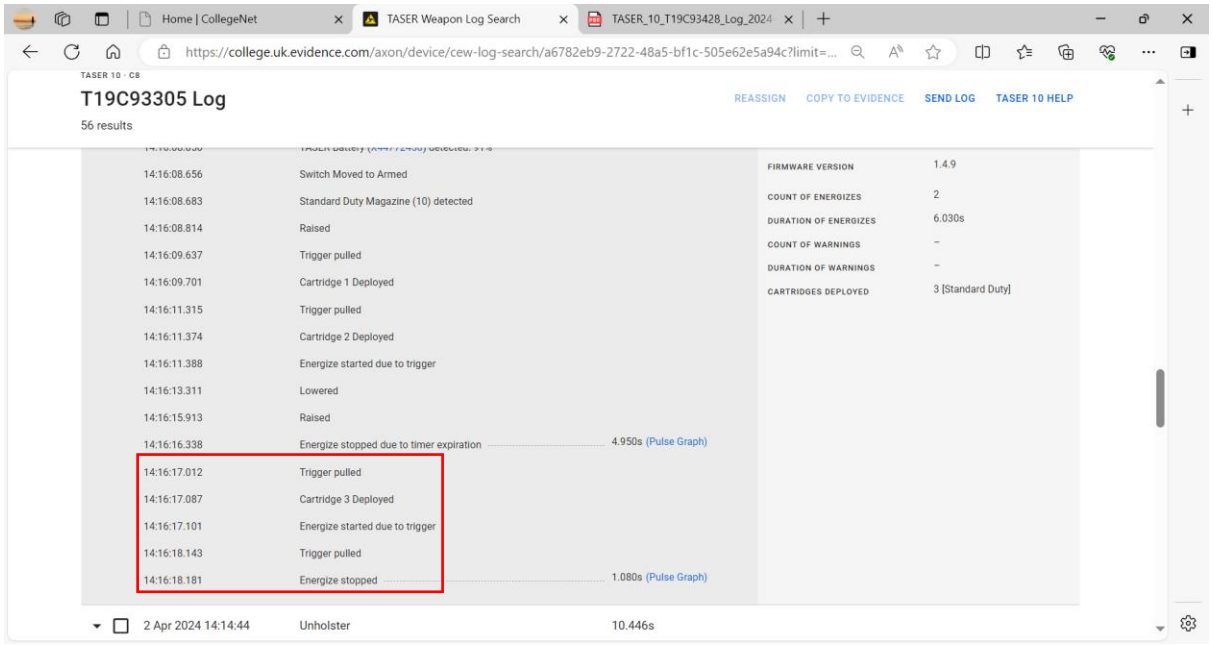


Figure 83, screenshot device log C8 exercise 4

On another occasion device C8 failed to discharge cartridges five and six during the third attempt of exercise 4. Examining the event log above it would appear that the deployment of the fourth probe has not registered, nor has the subsequent attempts in discharging the fifth and sixth probes. However, this log did export successfully to PDF.

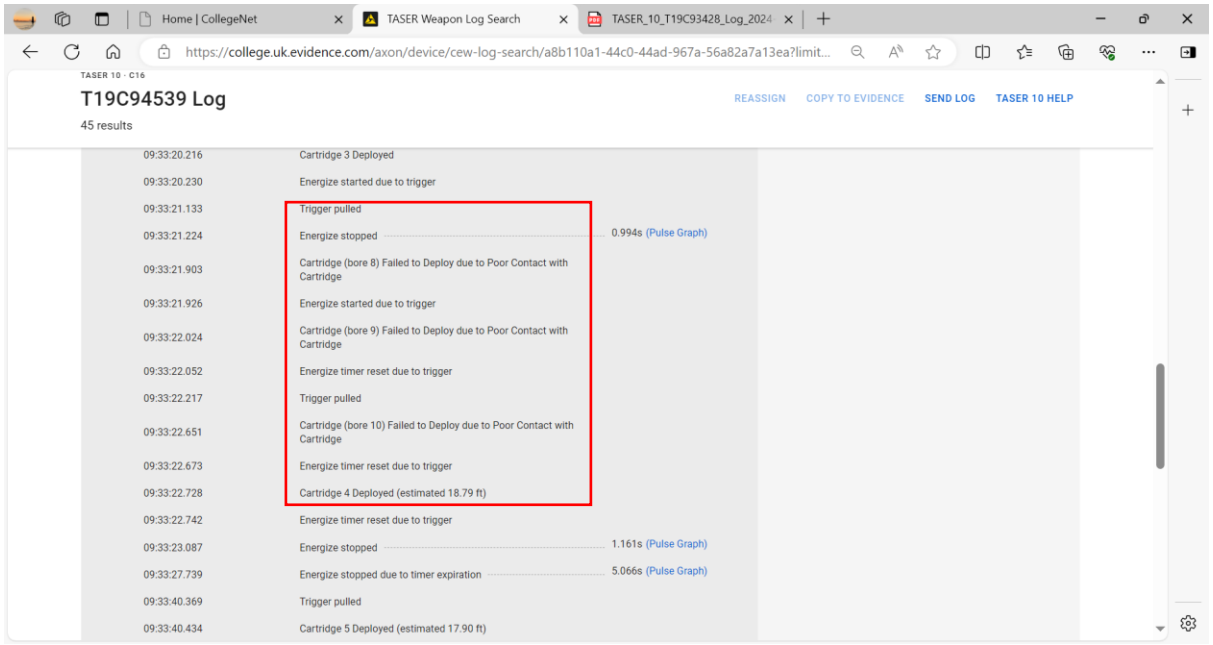


Figure 84, screenshot device log C16 exercise 2

Figure 84 above illustrates the event log from device C16 during exercise 2. As can be seen from the event log the device deployed the first three cartridges normally, but on the fourth trigger pull both bore 8 and 9 failed to deploy due to ‘poor contact

with the cartridge'. The officer pulled the trigger again and bore 10 failed to deploy, but within 0.511s the device selected another bore and deployed cartridge four successfully.

Whilst it's undesirable such failures occur; this does demonstrate the devices and officer's ability to work round such issues.

This log exported successfully to pdf.

Device C16 exhibited the same issue on the following two exercises, exercise 3 and 4, again with bore's 8, 9 and 10 failing to deploy.

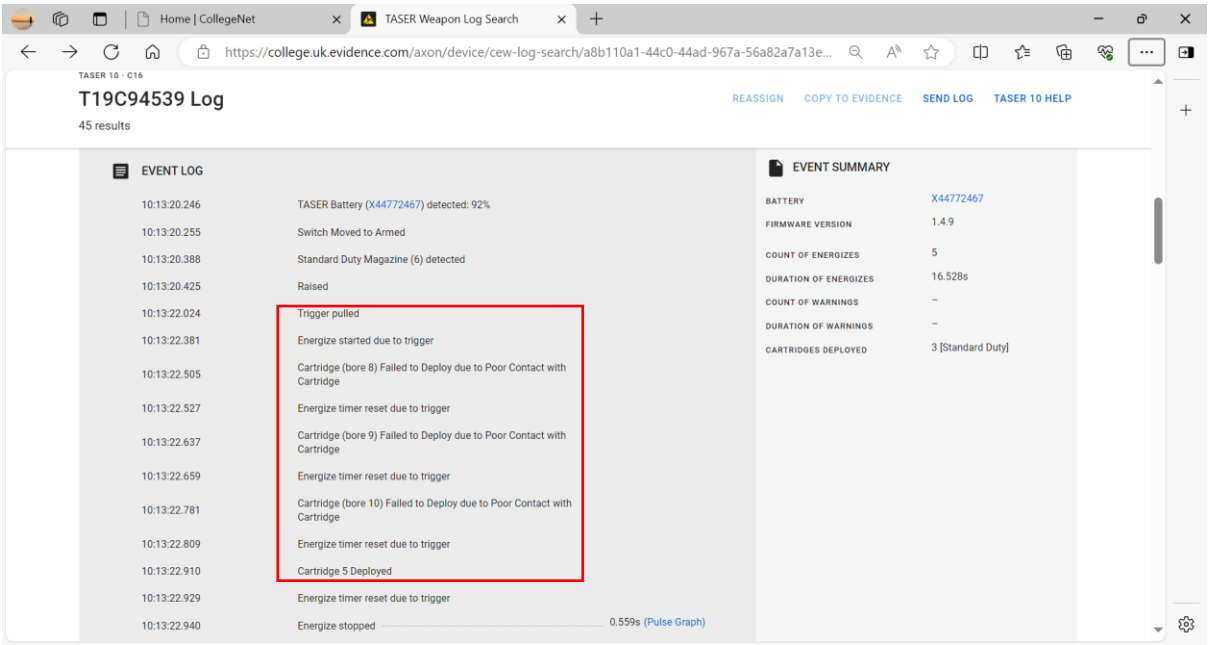


Figure 85, screenshot device log C16 exercise 3

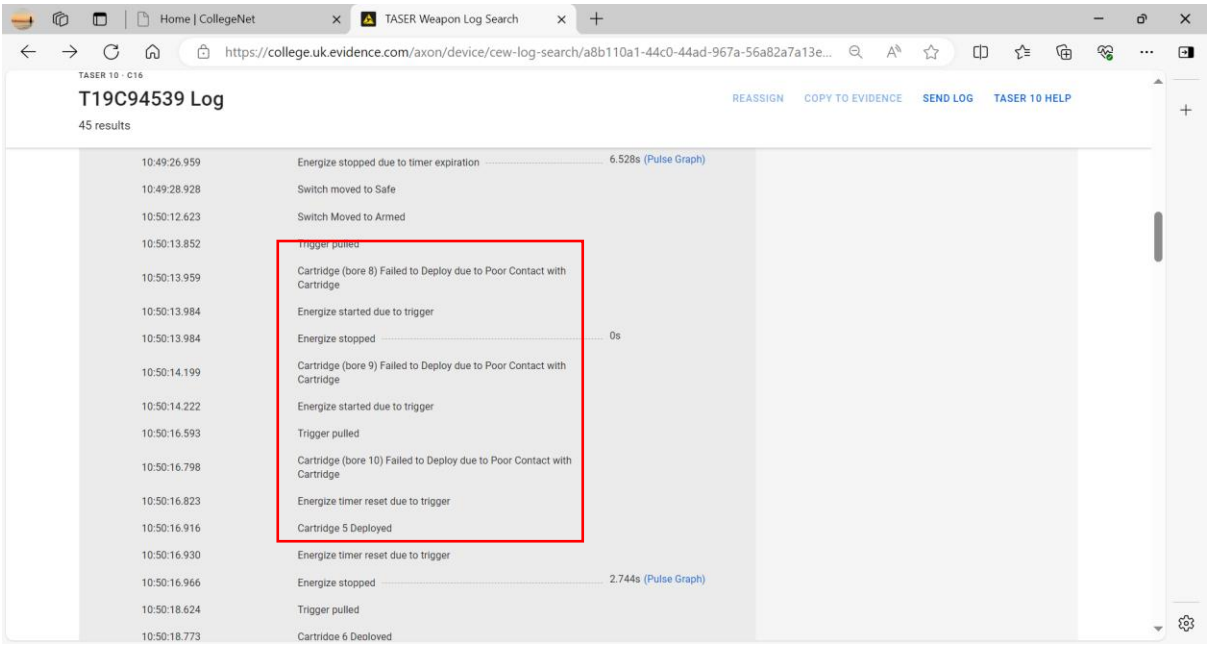


Figure 86, screenshot device log C20 exercise 1

Device C20 also exhibited a similar issue with bore's eight, nine and ten failing to deploy during exercise 1. Again, the officer and device essentially worked round this issue.

Interestingly two devices that logged failures to deploy 'due to poor contact with cartridge', it would appear they were all associated bore's eight, nine and ten (see figure 87 below).

Figure 87, cartridge rear view showing bore numbering system, © AXON Inc.

It is possible during an operational deployment, where the device deploys a cartridge as result of an identified bore failing to fire that the officer may not notice the fault occurring as they may be focused on the incident rather than the device.

It is of note that the device logs a bore filing to fire in the event log, which is a positive feature of the event log system. However, the only way to find such entries is to sift through every line of the event log on Axon Evidence. It would be beneficial if the Axon Evidence platform both flagged where a bore failed to fire to the system

administrator/Taser technician, and made such an event a searchable parameter within the application. This would ensure such occurrences are subject of remedial action and logging, and not simply and easily overlooked during routine maintenance.

Single trigger pull, two probes discharged (‘double-tap’) (A2)

Whilst this phenomenon was observed three times (0.4%) during UHT1 and five times (1.0%) during UHT2, it was not observed during UHT3. It is possible continued refinement of the device and firmware may have eliminated or significantly reduced this issue.

CID goes blank upon firing, no discharge/ entering sleep mode (A3)

Similar to the double-tap issue discussed above, the CID going blank and the device failing to discharge/entering sleep mode was not observed during UHT3. This again may suggest the device and firmware revisions may have eliminated or significantly reduced this issue.

Probe detaching, no wire visible or Wire snapping mid-wire (A4)

Whilst the wire snapping either mid wire or at the probe are subtly different in their presentation, the net effect is the same in that the system cannot deliver NMI via this probe. The analysis below considers this event as a percentage of cartridges fired, as it is likely this fault is associated with the cartridge rather than the device.

- In UHT1 there were two wire snap events (2:1782 or 0.11%)
- In UHT2 there was one wire snap event (1:1188 or 0.08%)
- In UHT3 there were four wire snap events (4:1320 or 0.3%)

Whilst there was a small increase in this fault type during UHT3 it remains at a very low frequency. The authors are not aware of any changes to the cartridge design or manufacture over the period of the three trials, indeed some of the cartridges remaining from each trial were used in the subsequent trial. Overall, the frequency of this fault was approximately 7:4290 or 0.16%

Battery error during use (A5)

Whilst one battery error during use of the device was displayed on the CID during UHT1, this fault did not occur during UHT2 or UHT3.

Probe jammed in magazine upon firing (A7)

Whilst this occurred once during UHT2, it was not observed during UHT3.

Category B, major faults UHT3

Two types of category B faults were observed during UHT3, spurious warning tones that continued beyond their expected timeframe and cartridge bay errors.

Warning tones extending past expected timeframe (B2)

During UHT2 26 exercise attempts (4.93%) were associated with a warning tone (either a connection alert or warning alert) that continued longer than it should have done. This usually required the selector switch to be moved to the safe position to terminate it. Curiously it did not occur at all during UHT1.

Axon's bulletin for firmware version 1.4.9 (used for UHT3) suggested this problem had been resolved. It stated (see appendix 3):

> 3) Sound Improvements
>
> Addresses issue with sounds (Warning Alert or Connection Alert) extending past expected timeframe
>
> Axon received isolated reports of the Warning Alert or Connection Alert continuing after the TASER 10 selector switch was no longer in the tap up position. In some cases, the sound did not stop despite a lost connection. This condition has been fixed in firmware 1.4.9.

During UHT3 this fault type occurred during 11 (2.04%) exercises. It would appear that whilst firmware 1.4.9 in combination with a revision B device has reduced the frequency of this fault type, it does persist to some degree.

A number of erratic or intermittent connection alerts were noted during UHT3, however it is the opinion of the authors that they are more likely as a result of the erratic connection/conductivity of the targets used. As the targets are not a valid or reliable surrogate for a human subject (nor were they designed to be) they have not

been included in the fault data in their own right, however some were associate with warning tones extended past the expected timeframe discussed above.

Cartridge bay errors (B1)

Cartridge bay errors were displayed on the CID during seven exercise attempts (1.30%). However, three were associated with a cartridge failing to fire (see category A faults above) and were not a fault in their own right, simply the device detecting an issue. These three have not been included in the category B data to avoid double counting errors.

Category C, identified faults UHT3

The only category C fault that occurred during UHT2 and UHT3 was the CID misreading the number of cartridges (C4). This affected 58 (11.93%) exercises during UHT2 but reduced significantly to 10 (1.85%) during UHT3.

For example, device C2 during exercise 4 showed seven cartridges available at the start of the third attempt when there were only six. This CID misread also translated to the event log, but all probe deployments were accurately recorded. In addition, the associated log entry accurately converted to PDF format.

The above example is typical of this fault type observed during UHT3, the others manifesting in much the same way. Interestingly the misreads were all associated with the selector being moved to the safe position in between attempts at the various exercises. It generally did not occur whilst the selector switch remained in the armed position.

Category D, identified faults (cleared) UHT3

Two types of category D faults (the type that are cleared through troubleshooting) occurred during UHT3, the CID misreading the number cartridges upon loading (D1) and an unresponsive device upon function checking (D2).

During the function checking process, the new graphic within the CID now displays the number of cartridges loaded as a result of firmware update version 1.4.9. (See figure 88) This is a welcome addition to the function check.

Figure 88, CID after completing function check (firmware version 1.4.9)

It is noted that this information, i.e. it is loaded with ten cartridges, does not appear on the device log until the device is subsequently armed. It would be of benefit if this information also appeared in the function check device log entry.

The officer also checks the CID for the number of cartridges available upon arming the device during their initial function checking procedure.

In UHT3 on three occasions (0.56%) the function check procedure revealed the device was recognising only nine cartridges. The authors found the simple expedient of either refitting the magazine, or where the problem persisted, rearranging two cartridges in the magazine resolved the issue.

One device (C8) upon function checking at the start of an exercise was completely unresponsive. Removing the battery and refitting cleared the issue and the device operated normally. It is of note this device had a critical fault on the previous exercise so this may be a continuation of the previous fault that was essentially ‘cleared’ by refitting the battery.

Summary of reliability

It is fair to say that reliability of the T10 system has been on somewhat of a journey throughout the evaluation. Communication with, and action by, Axon has seen progress in the reliability of the system. During UHT1 the percentage of 'trouble free' exercises was at its highest, however this comes with two important caveats. Firstly, UHT2 and UHT3 were undertaken by instructors and informed greatly by the knowledge and experience gained from UHT1. UHT2 and UHT3 were essentially an examination of reliability and more sensitive and alert to such issues, conducted by more knowledgeable and experienced operators. It should not be forgotten that the primary focus of UHT1 was the user experience. Secondly, during UHT1, a high percentage of the faults were of the most serious type (category A). UHT2 and UHT3 noted reductions in such faults from 4.3% (UHT1) to 3.3% (UHT2) and ultimately to 1.9% (UHT3).

	**Category A Safety critical fault**	**Category B Major fault**	**Category C Identified fault**	**Category D Fault cleared**	**Category E Negligible fault/issue**	**No fault**
T10 UHT1 n=727	31 (4.3%)	0	13 (1.8%)	1 (0.1%)	1 (0.1%)	681 (93.7%)
T10 UHT2 n=486	↓16 (3.3%)	↑ 24 (4.9%)	↑ 56 (11.5%)	↑ 4 (0.8%)	0	↑ 386 (79.4%)
T10 UHT3 n=538	↓ 10 (1.9%)	↓ 15 (2.8%)	↓ 9 (1.7%)	↓ 4 (0.7%)	0	↓ 499 (92.9%)

Also of note, during UHT3 35% of devices exhibited a category A fault at some point during the testing regime, and if category A and B faults are combined this increases to 70% of devices. Only 20% of devices performed all tests without exhibiting any faults.

Key finding 15

Key finding

Category A faults have more than halved in UHT3 compared to UHT1, and except for two exercises (0.37%), the officer could continue to operate the device and mitigate the issue.

However, whilst category B and C faults reduced, they remain to some degree. Principally this relates to warning tones extending past expected timeframe and CID misreads.

Warning tones that continue beyond the expected timeframe, particularly a connection alert, could present confusing information to the officer. However, officers are trained to operate a CED based on analysis of threat and the resulting subject behaviour change the CED produces. Interestingly the connection alert can be disabled in the agency settings, an argument could be made for disabling this function, encouraging officers to analyse the behaviour of the subject rather than focusing on the noise the device does or doesn't make. However, it should be noted the device has not been tested in this configuration, nor has the connection alert been subject of much feedback from officers. One assumes the connection alert has been included as existing users are familiar with a CED making a noise during use, therefore an absence of such auditory feedback may suggest the device is not working based on previous experience with legacy devices.

Whilst CID misreads have been improved from 11.9% in UHT2 to 1.7% in UHT3 they still do persist to some degree. Whilst a sixfold improvement is welcome, there remains room for further development. In addition, it should be noted during a deployment, similar to the above, the officer should not be concentrating on the CID, rather they should focus on the subject/threat. Therefore, this is unlikely to have any significant operational impact during its deployment. Where such misreads translate to the event log it does raise a concern, however it is of note that cartridge deployments were recorded correctly during UHT3.

Category D and E faults are noted to ensure this analysis of the T10 is comprehensive however, the number of category D faults was very low and by

definition are simply resolved through troubleshooting practices. Category E faults by definition are ‘negligible’ and none were noted in UHT2 and UHT3.

If the T10 system is to be adopted in the UK, it is anticipated it would be subject to enhanced monitoring and data recording that has followed the introduction of new CEDs in the past. It is recommended that the fault types, and their associated symptoms, identified in this report are included in instructor training and inform user training. This could assist in raising awareness and recording of such issues, the more subtle/minor of which could be easily missed. In addition, the T10 should be subject to a robust process that shares experience so such issues can be monitored, awareness raised, and solutions shared amongst all T10 forces/agencies.

It would also be advisable for Axon, as the supplier and manufacturer, to continue to engage in this process to maintain and improve a culture of continuous improvement and enhanced reliability of their products.

Reliability and further progress from this point are discussed further in the conclusions and recommendations of this report. (See pages 215 and 217).

Data download

As previously described the T10, in common with extant devices, records data parameters. The device log for each T10 device was examined in relation to exercise 5 during UHT1. Other than the examples and circumstances already outlined, they were found to be an accurate record of exercise 5 as far as could be ascertained.

An example is shown in figure 89, and the device log in figures 90 and 91.

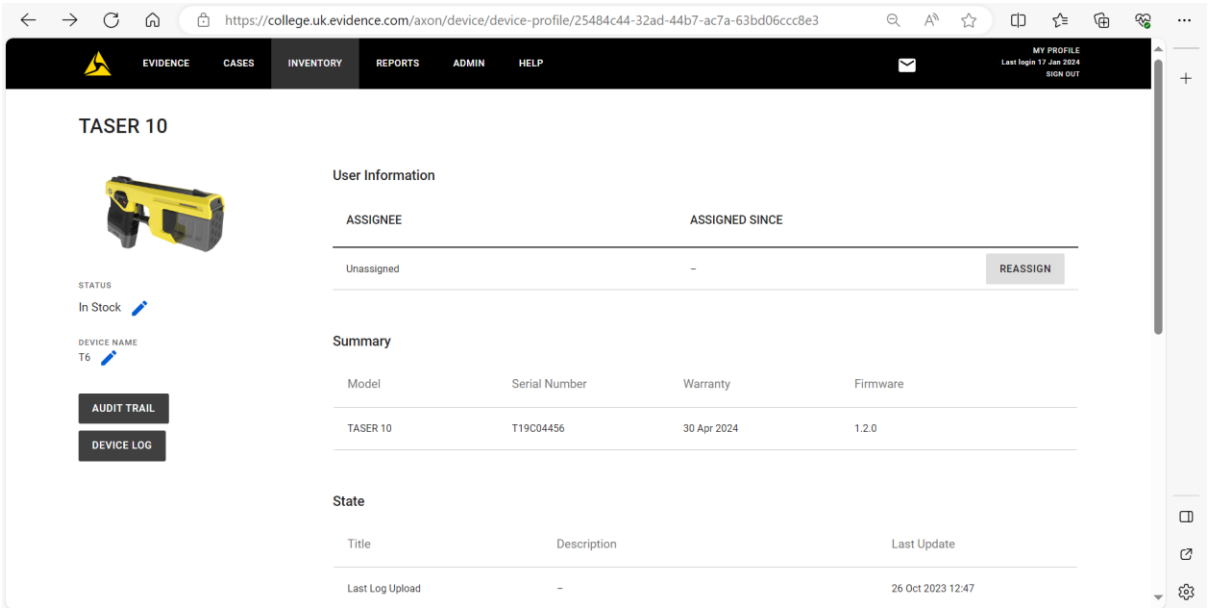


Figure 89, Axon Evidence screenshot (1)

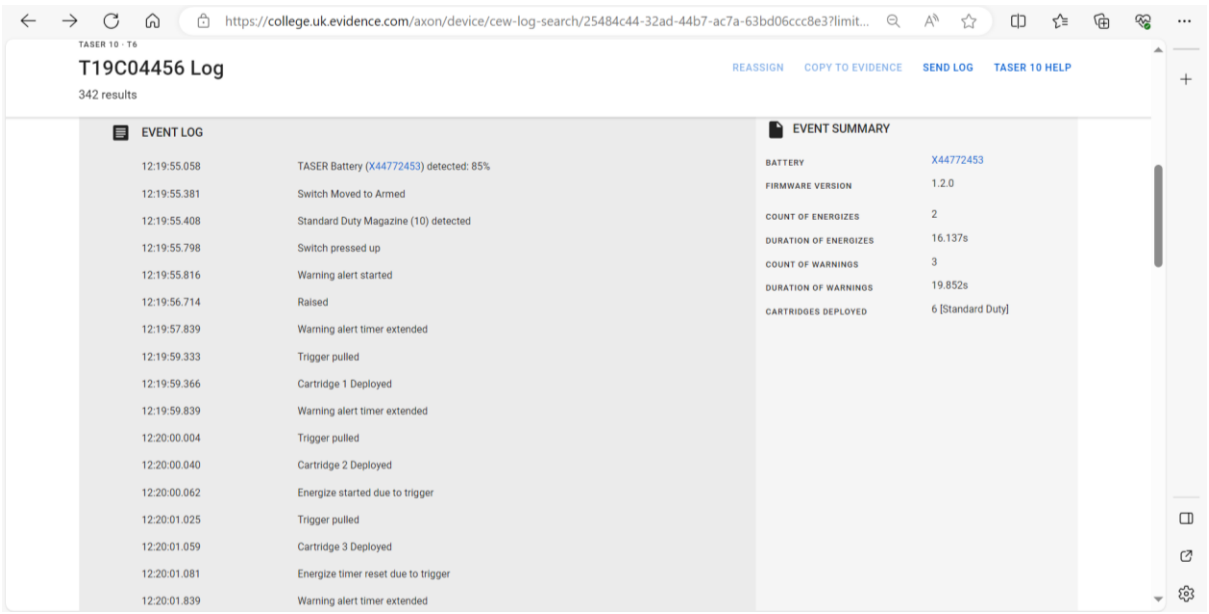


Figure 90, Axon Evidence screenshot (2) exercise 5

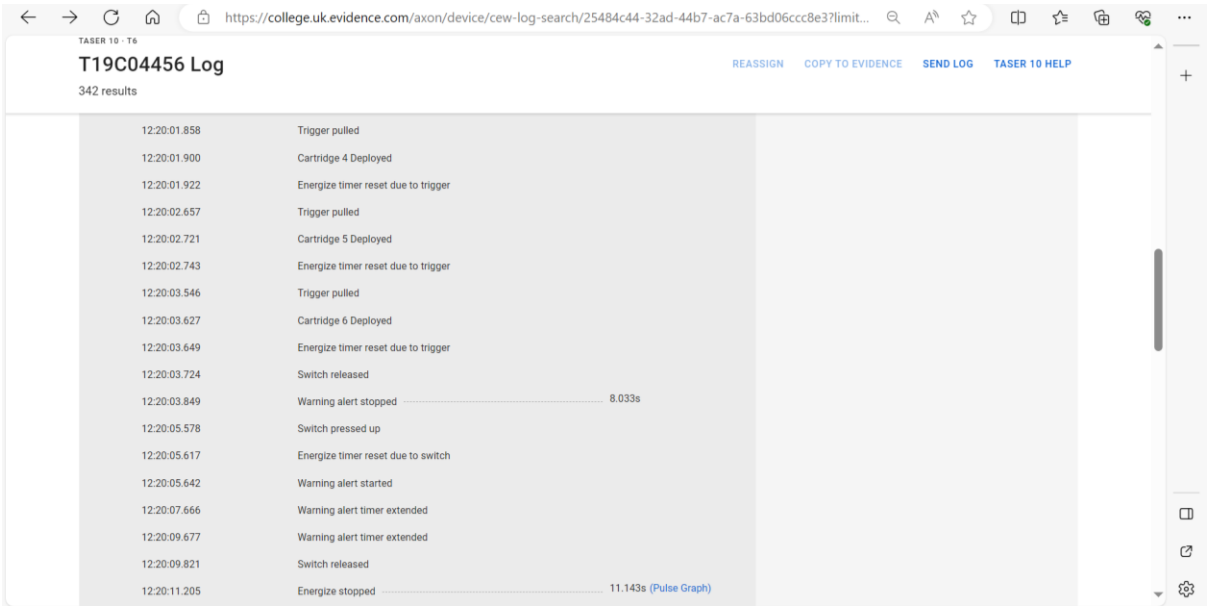


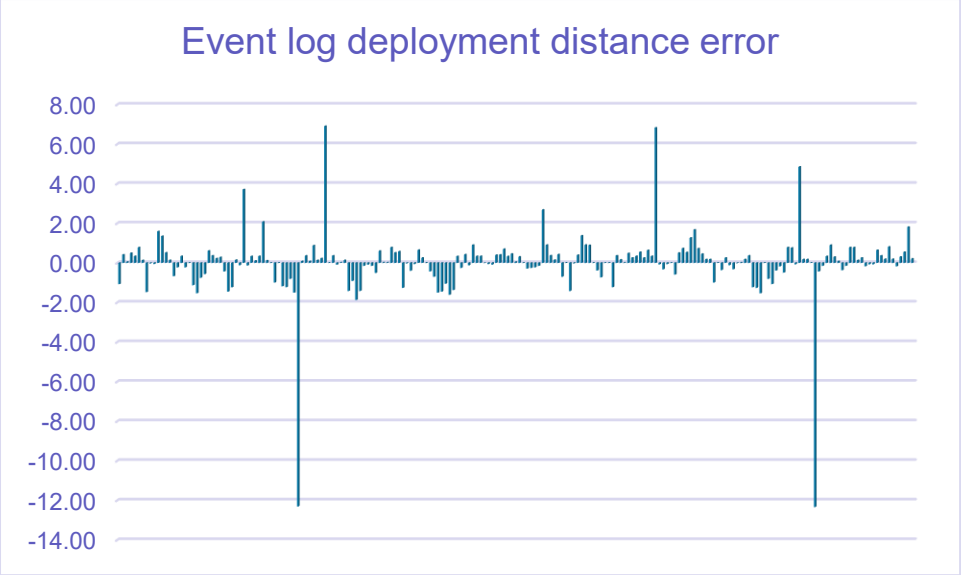
Figure 91, Axon Evidence screenshot (2) exercise 5

Deployment distance

One new feature of the T10 system is the ability of the device to measure the distance from the device to the subject, which may assist post use investigation. It is understood this is calculated by the time taken for a circuit to be established, as the velocity of the probes is known the distance can be computed.

The event logs for UHT3 were reviewed and 205 distance entries were found. Noting this is significantly less than the number of cartridges that were fired, it is prudent to point out that the targets used are not considered a valid or reliable surrogate for a human subject in terms of reliable conductivity.

The graph below shows the difference between the approximate deployment distance and the recorded distance (recorded in metres, note the event log records in feet, converted at 0.3048m/ft). On average the difference was 0.72m, the most accurate distance calculation was within 0.01m and the least accurate 12.33m. Considering all the recorded distances, 61.5% exhibited errors of less than 0.5m relative to the actual distance, 81.5% less than 1.0m and 92.7% less than 1.5m.



Graph 11, Event log deployment distance error

It should be recognised the devices were hand fired with the operator keeping the device aligned with an identified distance line marked on the floor, which had been measured with a laser measuring device. This could account for errors ±0.15m, however this does reflect how devices are deployed operationally.

Key finding 16

Key finding

Whilst the event log does give an approximation of the deployment distance on most occasions, it is notable that it is incorrect by a significant margin on some deployments.

Noting the limitations and caveats associated with this analysis, it is recommended that such potential discrepancies are noted in the absence of any more conclusive assessment.

Questionnaire responses

At the end of the trial of each system (UHT1 only), participants were presented with a questionnaire to complete. The questionnaire presented the same questions for the T10 and the device in which the officers were already competent, with the exception of new users, who answered in relation to the T10 only.

The questionnaire was completed at the end of the trial of the relevant device, without direct reference to the other.

The questionnaire first asked what roles (in which they are competent) they believe the device was suitable for.

Subsequent questions employed a four-point Likert[41] type scale (strongly agree-agree-disagree-strongly disagree).

Each question was posed as a positive statement, and they were invited to agree or disagree with the statement. The questions and format of the questionnaire was identical for both T10 and the officers' existing device. The only exception was a final question where they were asked to consider which device they were more 'confident' using 'at distance' and why.

They were also given the opportunity to comment on both the responses to the questions and raise any additional issues.

In considering the analysis below it should be remembered that the cohort size for each CED varied. (Note for questions in relation to: T10, n=27, X2 n=10 and T7 n=9)

[41] Likert, R. (1932). A technique for the measurement of attitudes. In R. S. Woodworth (Ed.), Archives of Psychology (Vol. 22, No. 140, pp. 5-55). New York: The Science Press.

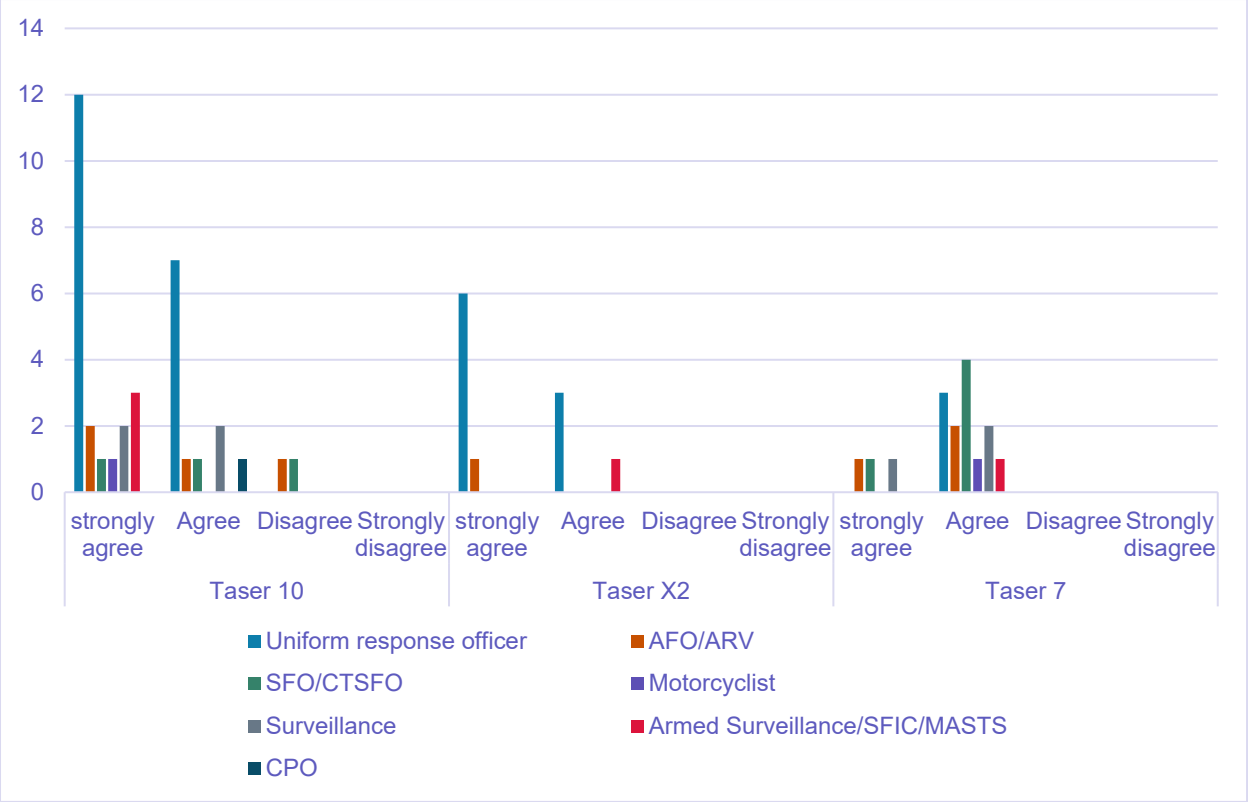
Participant survey

Suitability of system by role

Officers were asked whether each device was suitable for roles in which they were competent:

> The device is suitable for the role(s) below. (Only answer for roles in which you are competent.
>
> Uniform response officer
>
> AFO/ARV
>
> SFO/CTSFO
>
> Motorcyclist
>
> Surveillance
>
> Armed surveillance
>
> SFIC/MASTS
>
> Other (please specify)

The responses are summarised in the graph below.



One officer disagreed that the T10 was suitable for the AFO/ARV and SFO/CTSFO, being competent in both roles. They commented further:

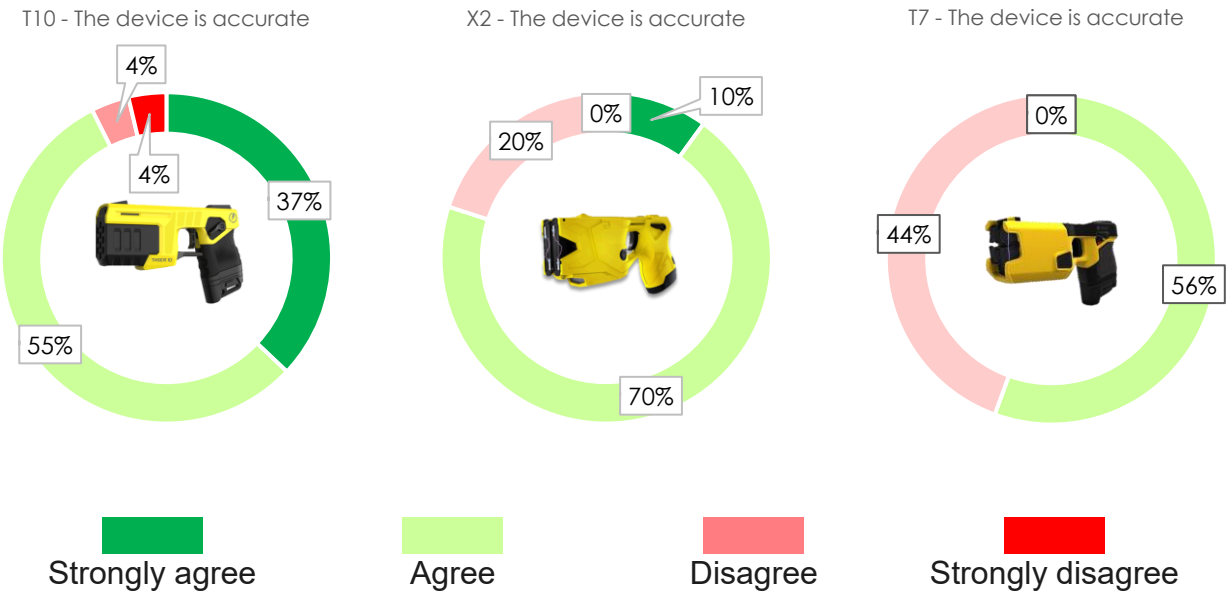
> *'Having used all taser products during my service I feel that overall it has some good features but feels somewhat gimmicky. Unlike the previous tasers, the impact of the ARC I don't feel will be impactive enough. Having used the AC WARNING ON Live incidents this has deescalated situations quickly. I feel like the T10 WARNING would be sufficient. The accuracy of the device is Hit and miss (I* [sic] *if I have to hit the skin). I do like the trigger switch but the extend and Reenergise could do with some work. I found it difficult with my thumb to push it up.'*

The same officer made comments in relation to accuracy, see question 2 below.

All other officers agreed or strongly agreed it was suitable for their role.

Q1. The device is accurate.

92% of the participants strongly agreed or agreed with this statement in relation to the T10.



This compares to only 80% of X2 users who strongly agreed/agreed in relation to the X2 and just 56% of T7 users in relation to the T7, none of whom strongly agreed.

The two officers who disagreed/strongly disagreed in relation to the accuracy of the T10 commented:

> *When doing accuracy shooting was surprised how unaccurate* [sic] *it could be as the laser would only be zero'd to 1 barrel and at greater distance (?) scope for missing greater.* (unarmed surveillance X2 user)

> *The accuracy of the device is Hit and miss (I* [sic] *if I have to hit the skin).* (CTSFO T7 user)

This was in sharp contrast to the accuracy data outlined above (which was not revealed to the participants) and the comments of the overwhelming majority of the cohort. Their comments included:

> *I much prefer the option to fire 1 cartridge at a time as it allows for much more accurate & effective shots, (STO X2 user)*

> *The device during my time of handling, I would say is accurate…*

> *I found it accurate and effective when in use.* (new user)

> *…liked the idea of single cartridges being fired as I found it accurate.* (new user)

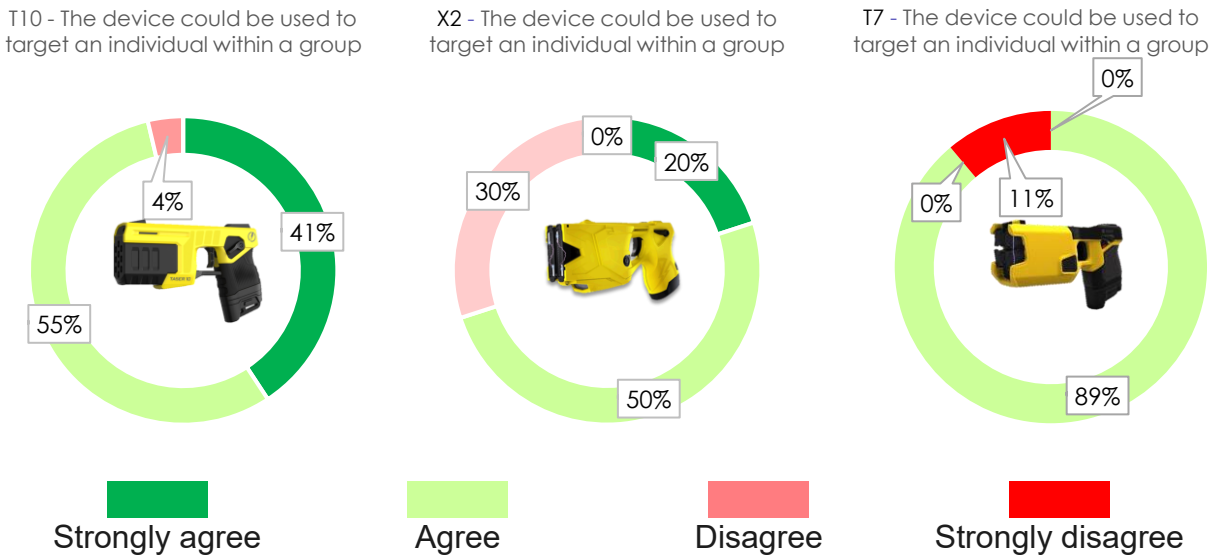
As a non taser user it's difficult to compare to the other tasers. However, the accuracy fills me with confidence… (new user)

I feel the Taser 10 is more accurate with the 2 aims [sic] *giving better precision for both/all shots.* (STO T7 user)

The accuracy was good with the laser but I struggled in stealth. This was maybe because of my lack of experience. (new user)

Q2. The device could be used to target an individual within a group.

In relation to the ability to target an individual within a group, 96% of the cohort either strongly agreed or agreed in relation to the T10, with only one officer disagreeing, although they did not comment further. This compares with 70% in relation to X2 and 89% in relation to T7.

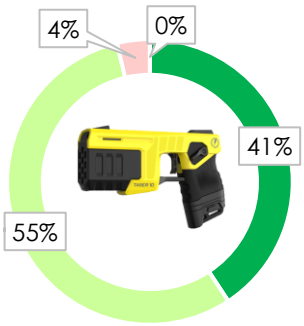


As a system requirement the ability to target an individual against a backdrop of others, or within a group, is linked to the accuracy of the device and the ease with which it is aimed and fired (see also Q4, below).

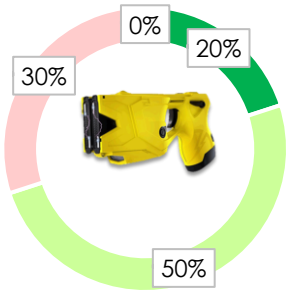
Q3. The device could be used effectively against a moving target at various ranges.

Comparing the T10 to the X2 and T7, 96% of officers agreed/strongly agreed that device could engage a moving target compared to 70% and 73% respectively for the X2 and T7.

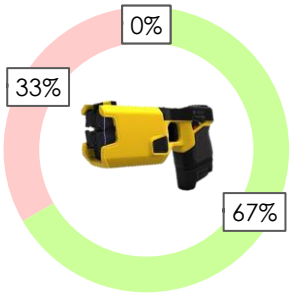
T10 - The device could be used effectively against a moving target at various ranges



X2 - The device could be used effectively against a moving target at various ranges



T7 - The device could be used effectively against a moving target at various ranges

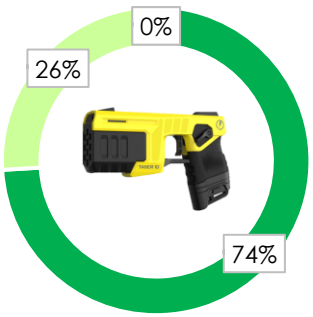


Strongly agree | Agree | Disagree | Strongly disagree

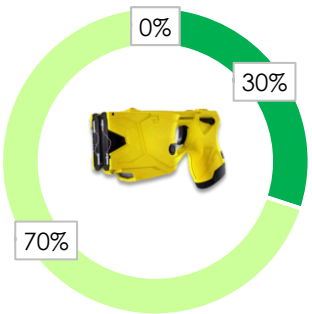
Q4. The device is easy to point and aim.

All officers thought that all three devices were easy to point and aim, either agreeing or strongly agreeing with this statement.

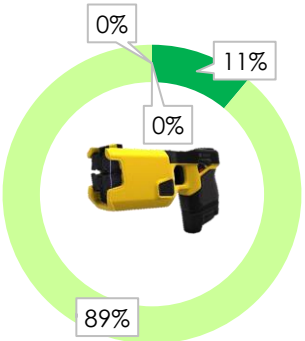
T10 - The device is easy to point and aim



X2 - The device is easy to point and aim



T7 - The device is easy to point and aim

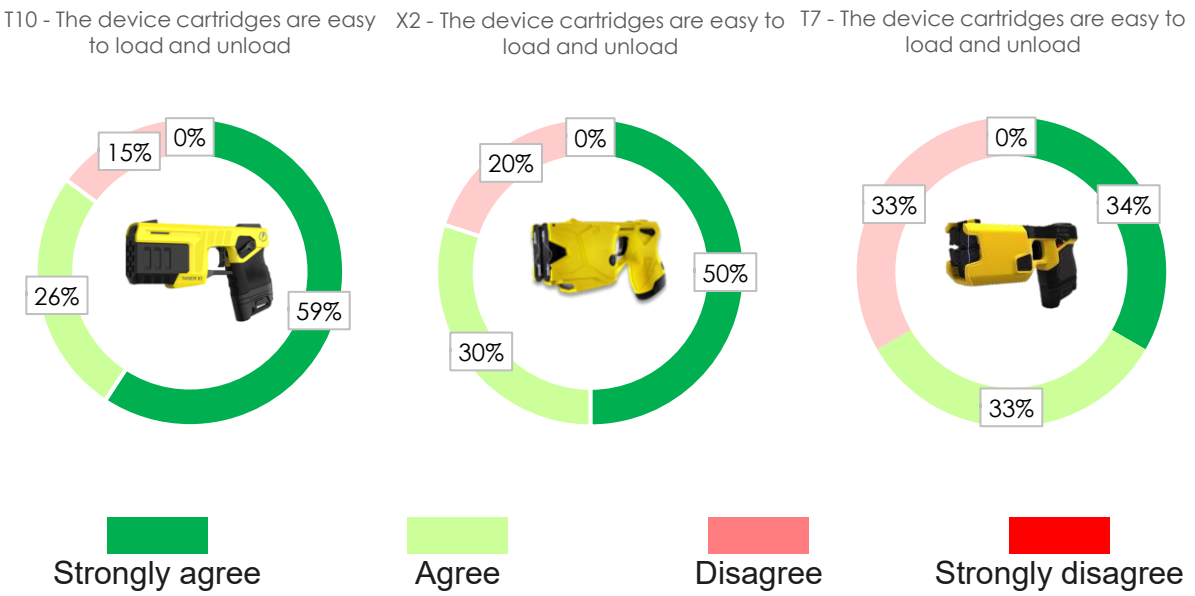


Strongly agree | Agree | Disagree | Strongly disagree

More officers strongly agreed in relation to the T10, possibly as a result of the simplicity of aiming a single probe.

Q5. The device cartridges are easy to load and unload.

In relation to loading/unloading 85% of officers agreed/strongly agreed that they were easy load/unload in relation to the T10, compared 80% for X2 and 73% T7.



Of note, it is not anticipated the T10 would be reloaded during an incident. Ten cartridges should be sufficient and far exceed what is immediately available with current devices. This is true with the X2 too, as generally, whilst officers may carry spare cartridges reloading is largely viewed as an administrative process.

This is in contrast to the T7 to some degree. As it makes use of two different cartridge types, for different distances. It may, therefore, be necessary for officers to change cartridges.

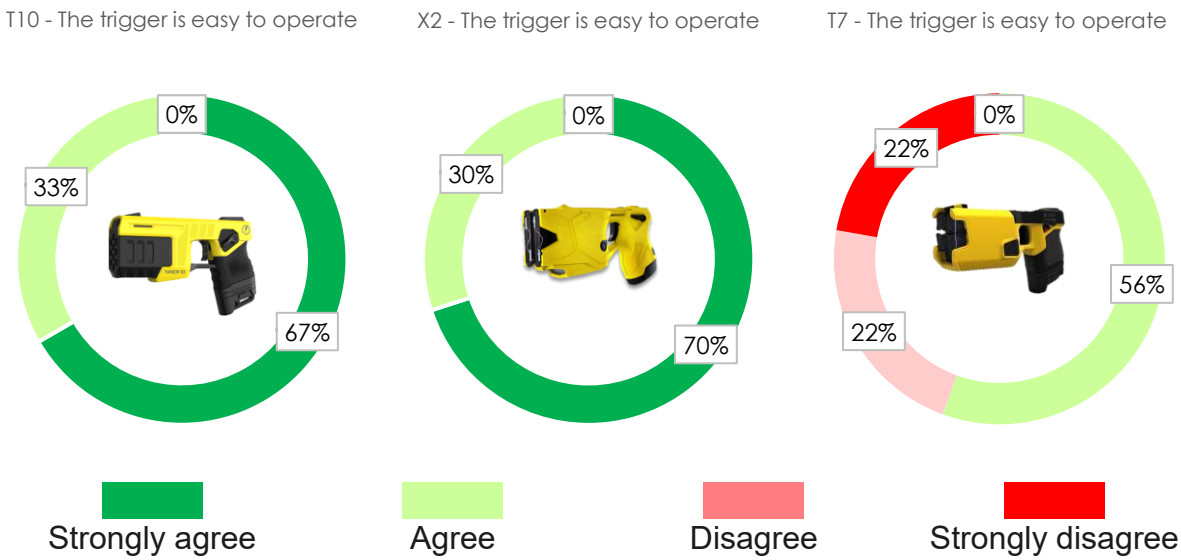
One officer commented:

> *Q5 – The carts can be a bit fidldy* [sic] *to unload but not impossible, maybe a multi load/unload device could be created?* (X2 user)

One would assume this relates to loading the cartridges into the magazine, as explained above it is highly likely this would be completed upon the device being issued rather than during a deployment.

Q6. The trigger is easy to operate.

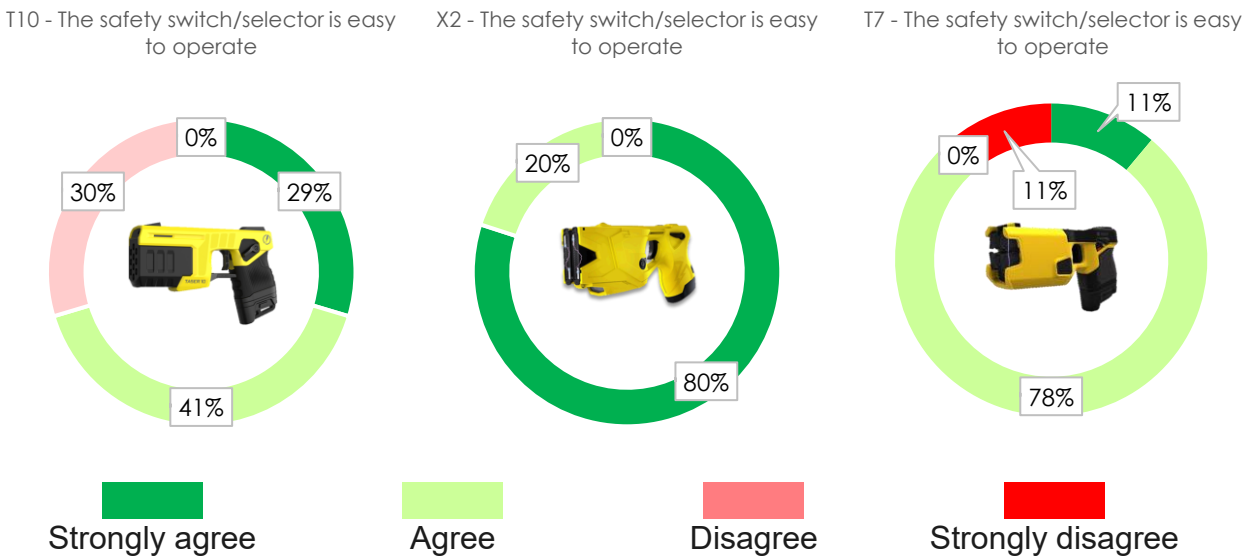
Whilst the trigger is in approximately the same position for all three devices, it varies subtly in its design (see **trigger** above).



Noting such differences, 100% of officers agreed/strongly agreed the T10 and X2 trigger was easy to operate. For the T7 this was 56%. This may be as both the T10 and X2, to some degree, use a mechanical trigger that impinges on a micro switch. Whereas the T7 is a simple pressure pad/switch. The integration of a mechanical component, and its associated ‘travel’ or movement, may give the trigger more ‘feel’ and feedback to the user. This also bears some similarity to triggers of conventional firearms.

Q7. The safety switch/selector is easy to operate.

Whilst 70% officers either agreed or strongly agreed in relation to the T10, 30%



disagreed. This may be as a result of the increased functionality, and relative complexity, of the selector switch rather than the more conventional 'safety switch' and arc switch combination. Officers further commented:

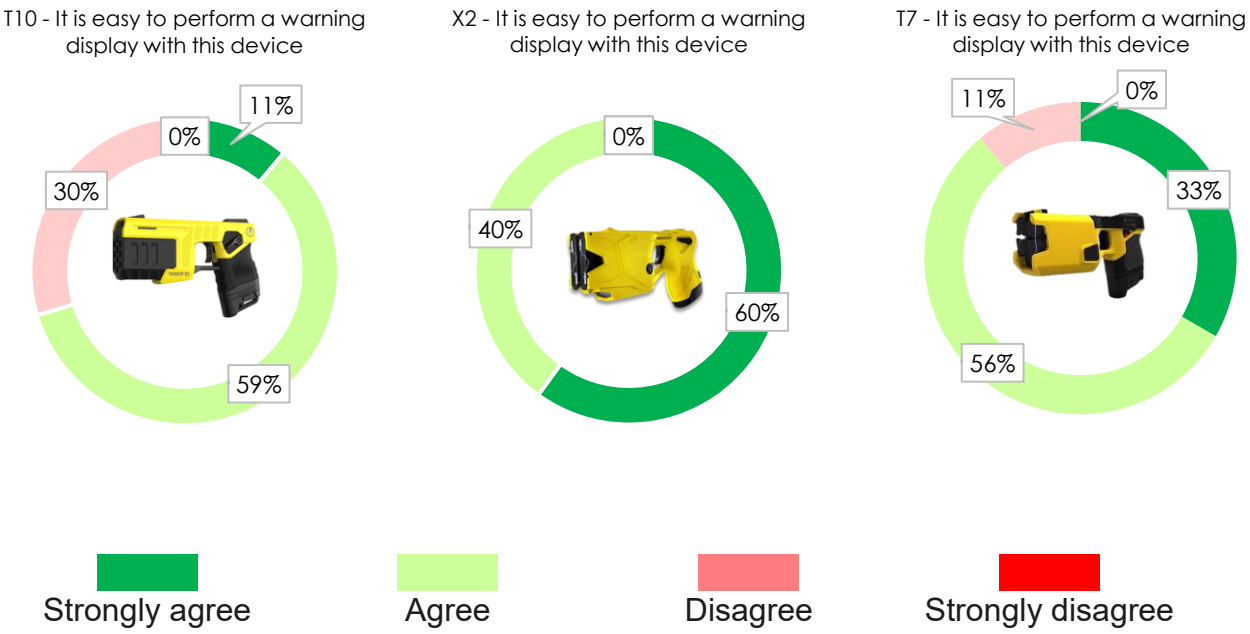
> *"SELECTOR/SAFETY SWITCH – This component is slightly too small – a larger switch (3-4mm) would make a better positive warning display easier to operate. At present the small switch (and quite stiff action) made performing the display difficult.*
>
> *The safety switch should be the safety switch only i.e. a downward pressure should only be for safety and not to perform the check function (this could be performed with a separate button?)" (X2 user)*
>
> *"Not as easy as the X2 however I think this is due to its placement on the device" (X2 user)*
>
> *"The safety switch is easy to operate as a conventional safety. The only issue I found was when doing a warning display, where the switch has to be pushed all the way up was awkward in compation* [sic] *to X2.*
>
> *Found this difficult using the arming thumb while being repared* [sic] *to fire the device." (X2 user)*

"As a new user of Taser and never handled one before, I found this device very easy to operate. I found the 'safety switch/selector' took some time for me to get used to, however I think this is just down to the device being new, as towards the end I found it much easier to operate." (new user)

Safety switch button rather small and fiddly (new user)

Q8. It is easy to perform a warning display with this device.

Question 8 is linked to question 7, and again may reflect the muti-function use of the



T10 selector switch. In relation to the ease of operating a warning display, 70% of officers agreed/strongly agreed in relation to the T10, compared to 100% for X2 and 89% for the T7. Officers commented:

"I had no issues in operating the selector lever however those with smaller hand/thumb sizes may have difficulty in engaging the warning display function for a prolonged period of time." (T7 user)

I prefer the X2s's re-energise/extend button over using the safety switch, due to having a smaller hand I sometimes struggled to maintain pressure up on the safety switch to preform the warning display/re-energise. (X2 user)

Officers did also comment on the potential effectiveness of the warning alert:

I don't think the warning display is as effective as the X2. I prefer the ""crackle"" of the X2 (X2 user)

Warning noise is rather childlike (like a toy) (new user)

I don't feel as though the warning display is as effective as the X2's 'ARC DISPLAY' (X2 user)

The safety switch is easy to operate as a conventional safety. The only issue I found was when doing a warning display, where the switch has to be pushed all the way up was awkward in compation [sic] *to X2.*

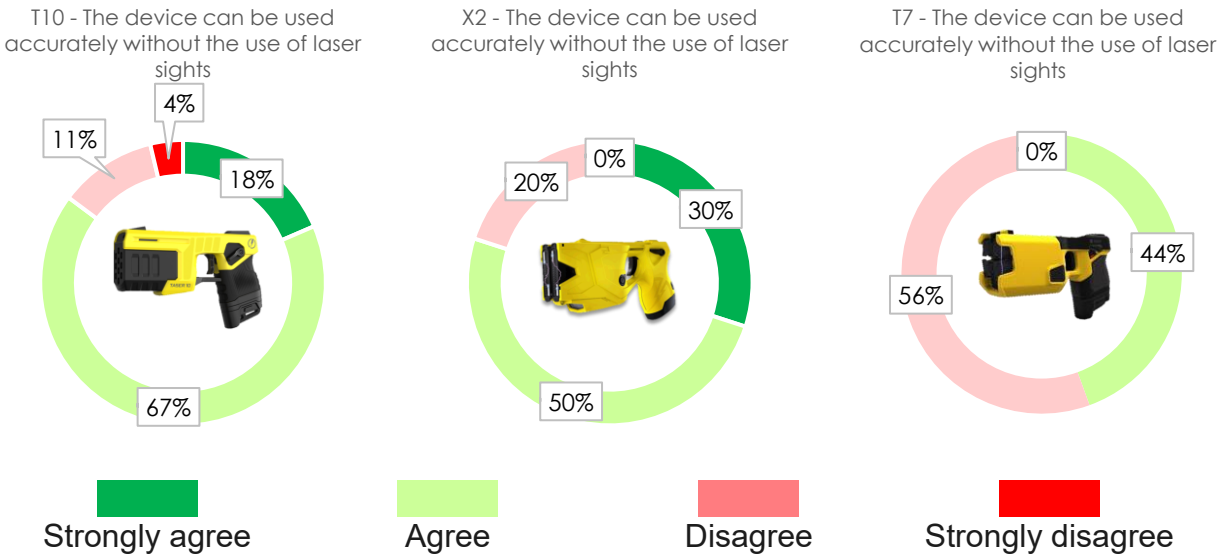
Found this difficult using the arming thumb while being repared [sic] *to fire the device.* (X2 user)

"…the selector switch was difficult to use in relation to warning display due to small thumbs. Switch could be bigger. After firing it would benefit from the ""arcing sound"" of the X2.

Warning display does not seem as effective as the X2 ""arc display"". (X2 user)

Q9. The device can be used accurately without the use of laser sights.

In relation to the T10, 85% of users agreed/strongly agreed it was accurate using the



fixed sights (stealth mode). This compares to 80% of X2 users and 44% of T7 users.

One officer (ARV officer) commented:

"I think the 'principles of shooting' would need to be taught in conjunction." (T7 user)

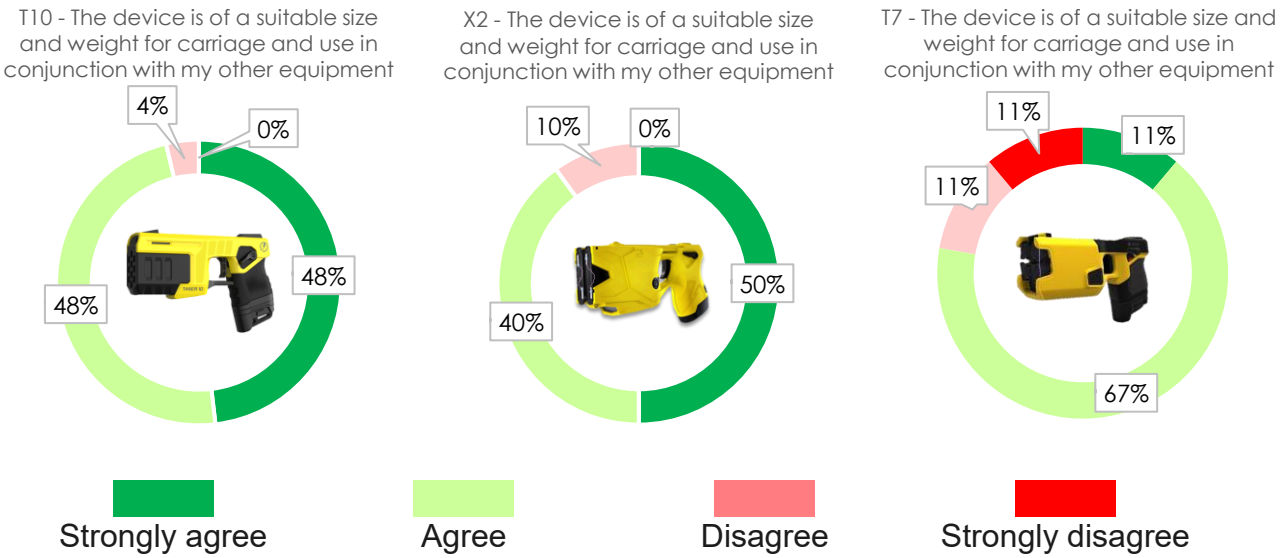
This probably reflects the training they would have received as an ARV officer using a handgun, and the increased maximum range the T10 could be used at.

A new user commented:

> *"The accuracy was good with the laser but I struggled in stealth. This was maybe because of my lack of experience."* (new user)

Q10. The device is of a suitable size and weight for carriage and use in conjunction with my other equipment.

In relation to size and weight, 96% of officers agreed the T10 was suitable compared



to 90% of X2 users and 78% of T7 users.

Only one officer (T7 user, female) made a relevant comment:

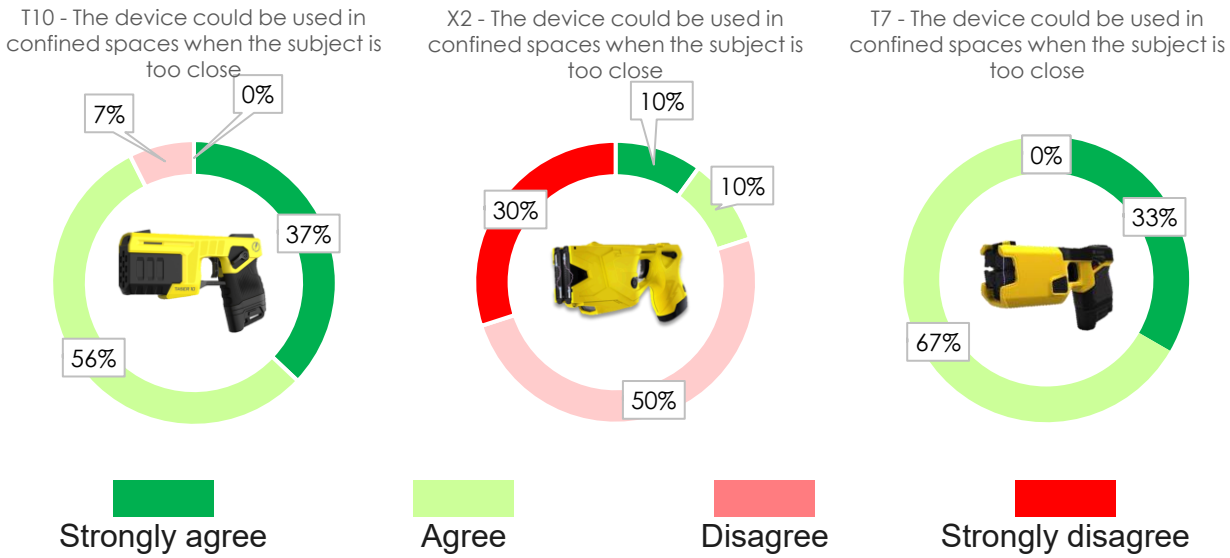
> *I did find the Taser 10 heavy compared to T7 which was a negative.*

But they went on to conclude:

> *Great bit of kit!!*

Q11. The device could be used in confined spaces when the subject is too close.

93% agreed/strongly agreed the T10 could be used in confined spaces, compared to



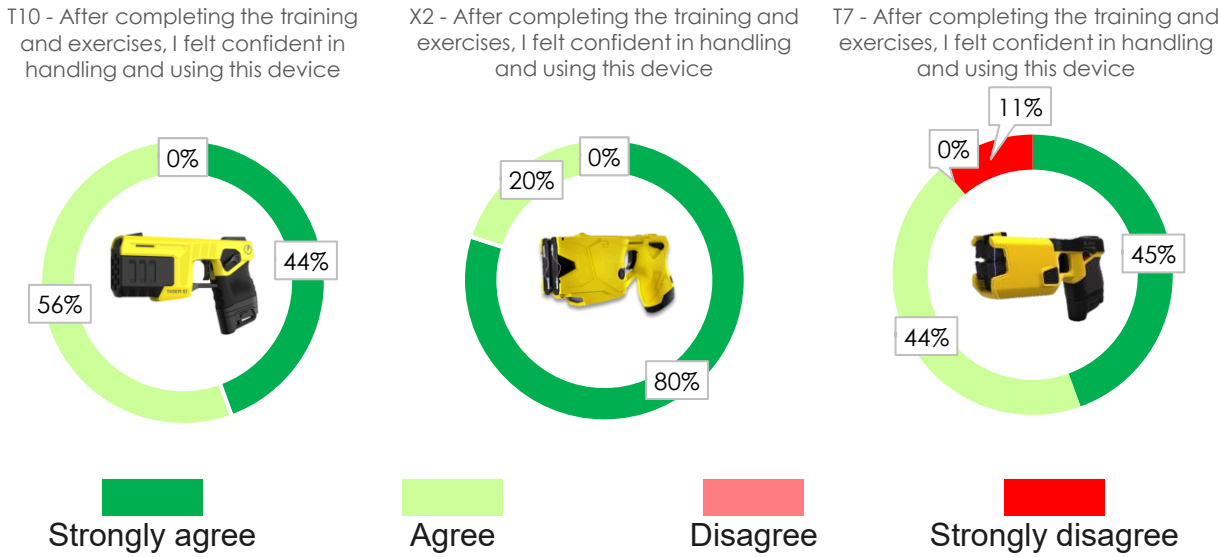
only 20% for the X2 and 100% for T7. This may reflect the differing methods of operation, with the T7 having a dedicated close quarter cartridge, the T10 having independently fired probes, and the X2 lacking either option with its single fixed firing angle.

Only one officer made a relevant comment:

> *The device in general is extremely good. The option to use it in confined spaces/short/long distance is very positive in operational policing.* (X2 user)

Q12. After completing the training and exercises, I felt confident in handling and using this device.

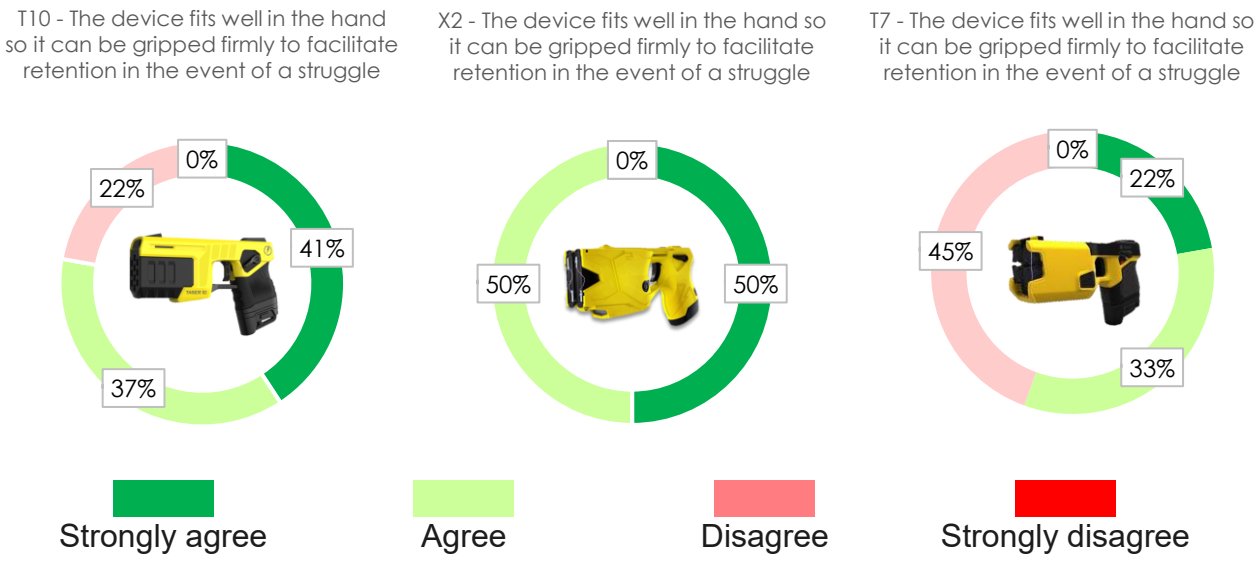
All officers agreed/strongly agreed felt confident in handling and using the T10 and



X2 after the trial. In relation to T7 this was 89%, this was a little surprising given it was the current in service device for these officers.

Q13. The device fits well in the hand so it can be gripped firmly to facilitate retention in the event of a struggle.

78% of officers agreed/strongly agreed with this statement in relation to T10,



compared to 100% for X2 and 55% for T7. This could be as result of the differing grip size.

Male officers commented:

> *Pistol grip small for people with large hands* (T7 user)
>
> *Pistol grip is too small making retention in the event of a struggle nigh on impossible.* (T7 user)
>
> *The pistol grip feels a little short when drawing and using* (X2 user)
>
> *As a user with larger hands, I found that my little finger slipped under the handle and I didn't have a positive grip when performing warning display.* (X2 user)
>
> *The magazine easily detaches when/if someone wants to take hold of the T10 from the front.* (T7 user)

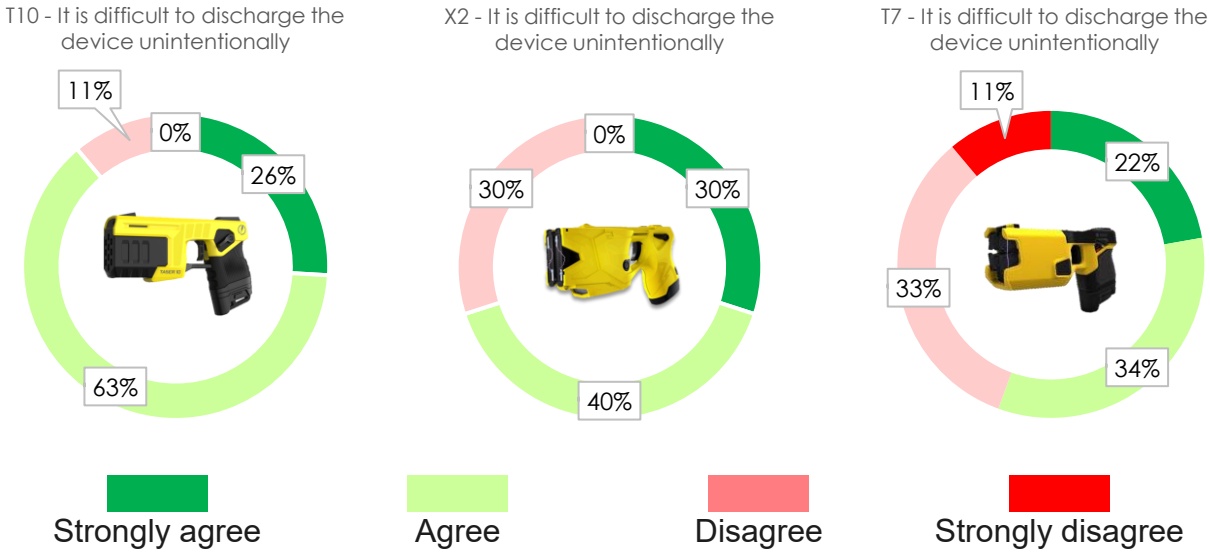
A female officer commented:

> *Taser was easy to handle but handle/grip was quite wide for someone with small hands. Overall easy to use + I would feel confident with this device.* (new user)

The comments of the grip being too small vs too wide may reflect the challenge in producing a ‘one size fits all’ device, and packaging the battery within the grip, which will inevitably limit the form factor. Whilst it may be too late for this device, looking to the future one could speculate a more flexible solution may be to offer interchangeable grips to allow the size to be tailored to the individual, as seen in many modern handguns. To some degree grip length has been accommodated by Axon with alternative battery options.

Q14. It is difficult to discharge the device unintentionally.

89% of officers agreed/strongly agreed in relation to the T10, compared to 70% (X2)

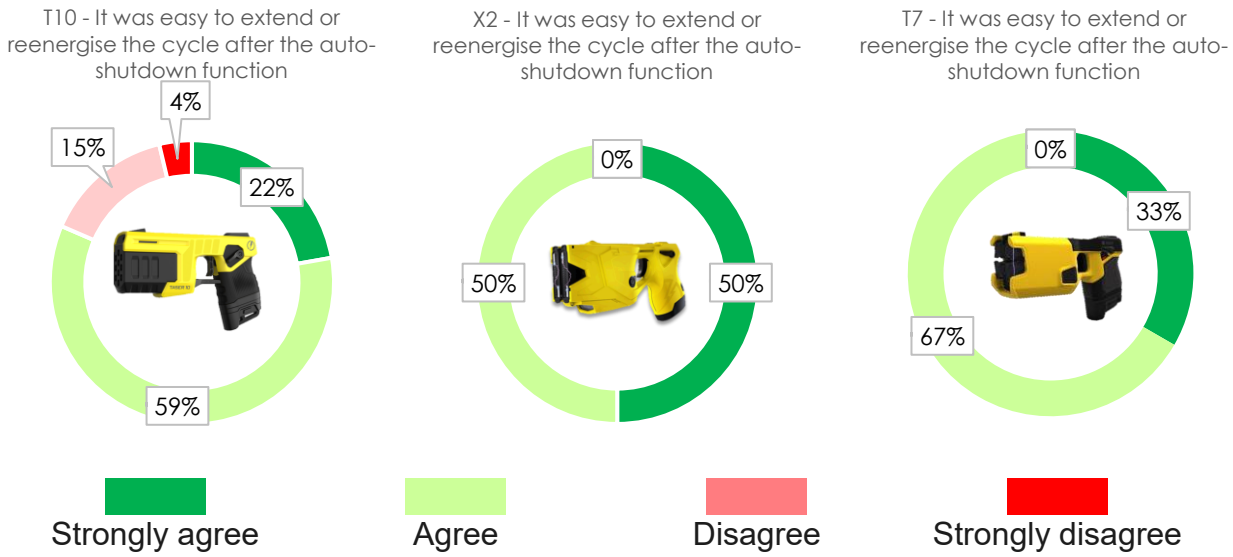


and 56% (T7).

Other than the relative trigger pressure and resistance of the safety/selector switch all three devices are broadly similar in this regard, being semi-automatic. One could postulate the consequences of unintentional discharge are broadly in line with the medical implications for each device, however, in the case of the T10 it is likely only one probe would be subject to an unintentional discharge, therefore if it accidentally hit a person, they would not receive NMI unless probes had already been deployed. One could therefore make an argument the consequences of unintentional discharge may be less with a T10 as they may be limited to the probe itself.

Q15. It was easy to extend or reenergise the cycle after the auto-shutdown function.

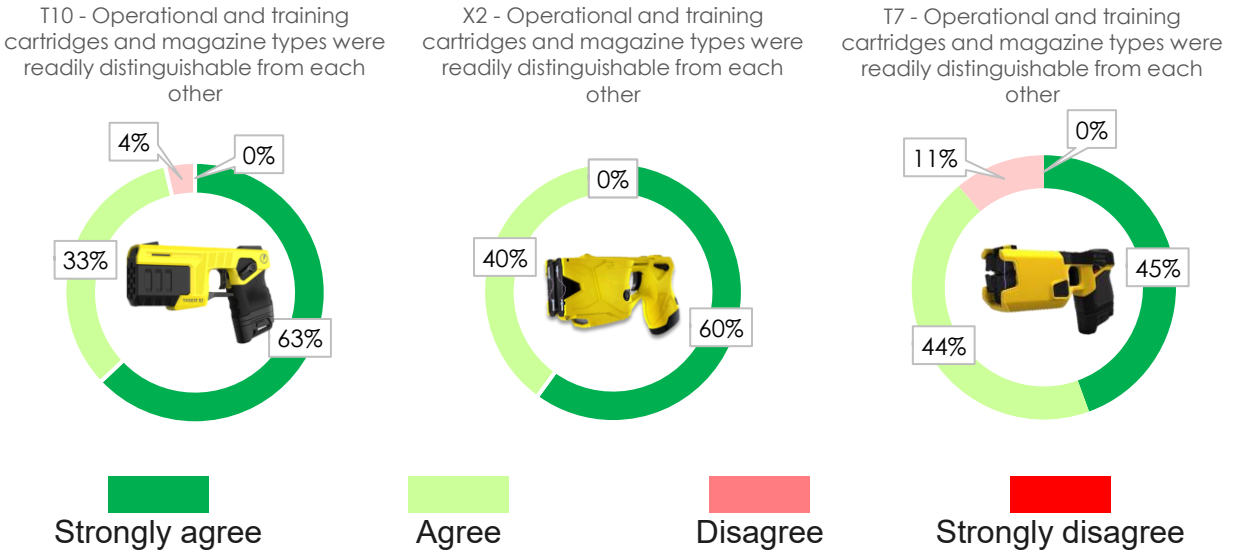
81% of officers agreed/strongly agreed in relation to the T10, compared to 100% for



both the X2 and T7. In common with the comments above, this probably relates to the differing manner in which the device is re-energised using an arc switch with X2 and T7, compared the slightly more complex action of the multi-function selector switch of the T10.

Q16. Operational and training cartridges and magazine types were readily distinguishable from each other.

96% of officers agreed/strongly agreed in relation to T10, compared to 100% X2 and



89% for the T7.

Officers commented:

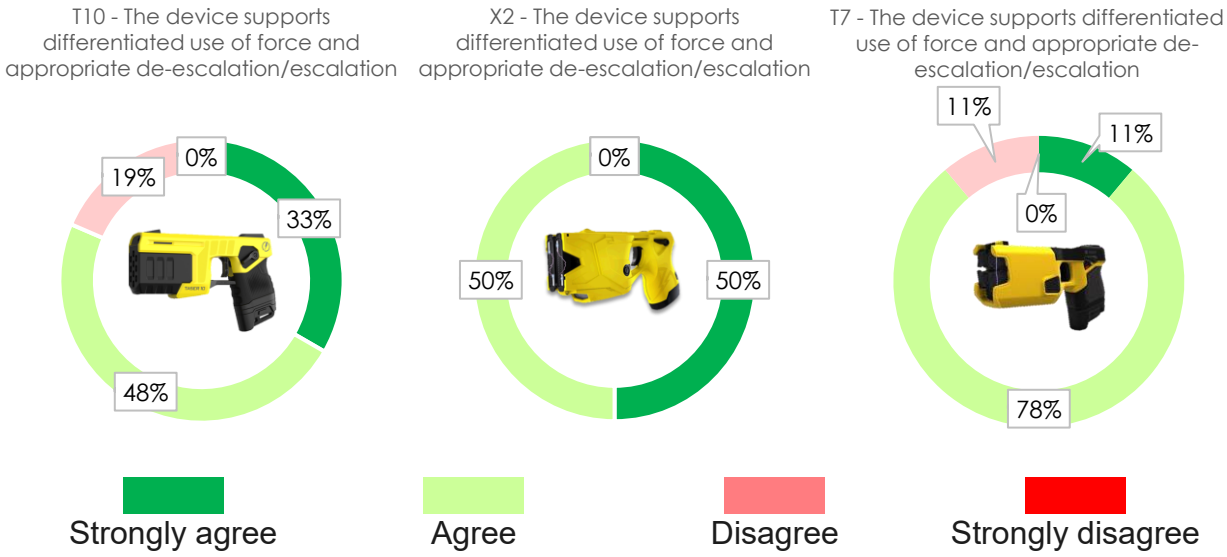
> *I liked the colour coded system when it came to magazines* [sic] *and cartridges as it made it safer for live and training scenarios.* (new user)

> *Magazine colours Cleary identify their function however cartridges may be easily mistaken.* (T7 user)

The use of colour coding system to identify cartridges and magazines, and the potential implications for officers with colour vision deficiency (CVD), is subject of further research by Newcastle University as part of their wider CVD research in relation to officers equipped with CEDs and firearms.

Q17. The device supports differentiated use of force and appropriate de-escalation/escalation.

81% of officers agreed in relation to the T10 compared to 100% (X2) and 89% (T7)



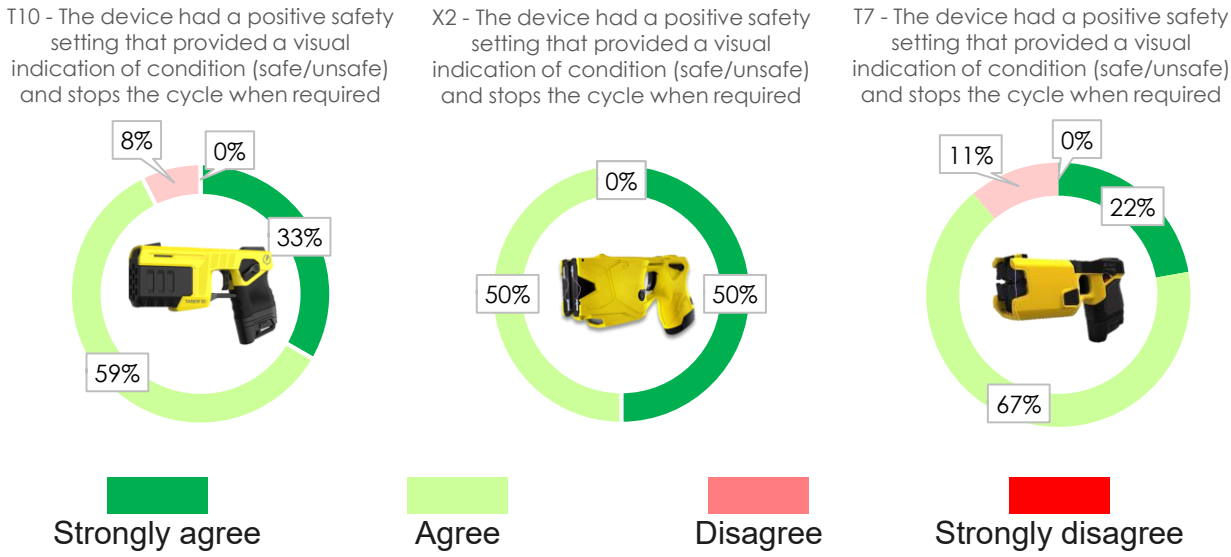
This may reflect the officers' comments in relation the effectiveness of the warning display of the T10 (see comments in relation to question 8 above).

One officer commented:

> *The ARC warning/light display is pretty much pointless and would be better if the sound mimicks* [sic] *the ARC sound of T7.* (T7 user)

Q18. The device had a positive safety setting that provided a visual indication of condition (safe/unsafe) and stops the cycle when required.

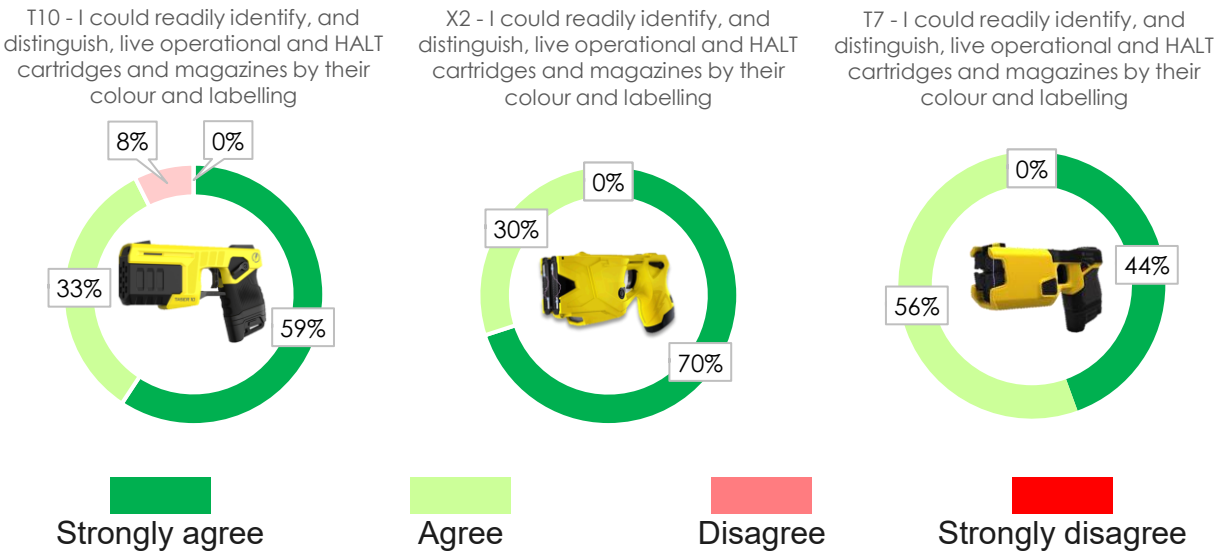
92% of officers agreed/strongly agreed in relation to the T10, compared to 100%



(X2) and 89% (T7). Generally, all devices are quite similar in this regard, with only the T10 differing with two additional spring-loaded positions for the selector switch.

Q19. I could readily identify, and distinguish, live operational and HALT cartridges and magazines by their colour and labelling.

This question is broadly similar to question 16, for which the comments are also



relevant. 92% of officers agreed/strongly agreed in relation to T10, compared to 100% for both X2 and T7.

One officer commented:

> *"I liked the colour coded system when it came to magazines [sic] and cartridges as it made it safer for live and training scenarios."* (new user)

Q20 Which device are you more confident using at distance and why?

Of the nine T7 users all chose the T10, of the ten X2 users eight chose the T10 with two preferring the X2. Overall, of existing CED users 17 of 19 (89.5%) preferred the T10 in this regard.

T7 users commented (preferred device shown in parenthesis):

- (Taser 10) - *Although I have seen varying inaccuracies on a target, the TASER T10 is still effective at distance over the T7.*
- (Taser 10) - *The T10 offers greater distance than the T7 I also found for me the T7 dropped on the bottom probe*
- (Taser 10) - *The T10 in my opinion is more accurate and due to the 10 cartridges gives you more chance of resolving the threat*
- (Taser 10) - *Due to the individual shot aiming I am confident I can get better probe spread whereas the T7 will drop will drop off and I may lose the bottom probes*
- (Taser 10) - *The capability of distance firing with the Taser 10 appears far greater than Taser 7.*
- (Taser 10) - *The T10 offers greater distance capability and the multishot ability gives the option to address misses at greater distance whilst under stress and duress.*
- (Taser 10) - *Increased distance and better flight of the T10*

X2 users commented (preferred device shown in parenthesis):

- (Taser 10) – *I've only used Taser 10 over two days but I feel confident using it and I prefer it over the X2*
- (Taser 10) - *T10 - Distance - far or near - I felt T10 was better and felt more confident.*
- (Taser 10) - *Taser T10 has clearly been more effective during the trial over distance.*
- (Taser 10) - *Having used the device I can appreciate that it is more accurate and can be operated at a greater distance*
- (ASSUMED T10) - *Range & ease of shot placent [sic] as individul [sic]shots make it easy to hit approprite [sic] target areas.*
- (ASSUMED T10) - *T10 - Confidence in distance however I am happy to remain with X2 for reliability.*
- (Taser 10) - *It is much more accurate and the probe placement is determined by user not the distance between device/subject or height of shot.*
- (X2) - *I only have to take, potentially, one shot to achieve NMI - with T10 taking two shots could be more difficult.*
- (Taser 10) - *Due to the single shots feature which isn't affected by range*
- (X2) - *but only to its maximum distance which isn't as far as the T10. Felt the overall accuracy of T10 not that good.*

Comparison of results for women and men

Nine of the cohort of 27 officers were female, of which five were also new users. Therefore 55.5% of female officers were also new users, in comparison only three male officers (16.6%) were also new users.

Comparing the accuracy of male and female officers should therefore be treated with caution as their lack of experience as a new user may be a more influential factor than their sex.

In the College's [2020][42] examination of relative accuracy of experienced officers, six male and six female, using both the T7 and X2 it was found:

> Examination of the results across all exercises show that male and female officers produced very similar results, suggesting the officer's sex has no influence on accuracy. Women were marginally more accurate than men, but not by a significant amount.

Therefore, it could be anticipated men and women would produce similar accuracy results in this trial, if other factors are excluded.

As can be seen by the analysis above new users were generally less accurate to some extent, than more experienced users.

The results below should therefore be caveated by the fact that the proportion of new users amongst the female officers was significantly higher than it was amongst the male officers.

[42] **T7_Supplementary_Accuracy_Report.pdf (publishing.service.gov.uk)**

Table 34, comparison of female and male officers' T10 accuracy

Radial distance POA to POI									
			T10 all users	T10 female users			T10 male users		
			Mean POA POI	Mean POA POI	Min POA POI	Max POA POI	Mean POA POI	Min POA POI	Max POA POI
1 top probe	3m	laser	2.9cm	**3.4cm**	0cm*	12cm*	**2.7cm**	0cm	9.2cm
2 top probe	5m	laser	4.4cm	**4.0cm**	1.0cm*	8.1cm*	**4.6cm**	0cm	9.9cm*
3 top probe	5m	fixed	7.6cm	**11.3cm**	2.2cm	32.6cm*	**5.9cm**	0cm	24.0cm*
4 top probe	3m	laser	2.9cm	**3.0cm**	0cm*	6cm*	**2.8cm**	0cm	7.0cm
5 top probes	3m	laser	3.3cm	**3.4cm**	0cm*	12.5cm*	**3.2cm**	0cm	9.1cm
5 time			5.5s	**5.8s**	2.75s	9.5s	**5.4s**	2.27s	10.96s
2A top probe	10m	laser	8.1cm	**8.6cm**	3cm*	18.5cm	**7.8cm**	1.4cm	24.1cm*
3A top probes	10m	fixed	14.5cm	**20.9cm**	6.7cm*	54.6cm*	**11.2cm**	2.1cm	31.1cm*
2B top probe	13.7m	laser	12.3cm	**12.8cm**	0cm*	25.7cm	**12.1cm**	0cm	33.0cm
3B top probe	13.7m	fixed	17.3cm	**19.3cm**	1.4cm	34.5cm*	**16.4cm**	4.5cm	36.0cm

In considering the accuracy results of female and male officers, generally male officers were more accurate. However, when using the laser sight, the difference was minor, varying from 2-8mm.

When using fixed sights, the difference was greater varying from 29mm to 97mm. One could speculate this may be for several possible reasons; the high proportion of new users amongst the female group, the high proportion of handgun trained officers amongst the male group (no female officers were handgun trained), the difference in

relative strength to hold the CED steady during firing (accepting when using the fixed sights the device may need to be held steady for longer), and the physical interface of the device and the officer (accepting differences in relative size etc. between men and women).

Considering each of these potential factors:

- **High proportion of new users**. Considering table 34 above, the least accurate shot for each exercise amongst the female group was coincident with a new user in all exercises except exercise 3B. Whilst this wasn't as significant amongst the male group, when considering the least accurate shots of each exercise in four exercises it was a female officer and five exercises it was a male officer. Where this occurred with a female officer it was generally coincident with a new user.
- **Handgun training**. As already explained above, generally when using fixed sights officers trained in handguns were more accurate than those that weren't. Therefore, this group of officers may 'improve' the average accuracy of the male group but have no influence on the female group.
- **Relative size and strength**. Whilst its generally accepted that men are, on average, physically stronger than women, it is beyond the scope of this report to explore this factor with any degree of reliability, when analysing accuracy data.
- **Form factor.** The T10 device, in common with other CEDs, is very much a 'one size fits all'. How it suits the commonly smaller hand size of female officers is an important consideration.

Potentially of more significance than raw accuracy data in this regard, is the feedback from officers, particularly female officers, where hand size or strength is a possible factor.

Table 35, average height and hand size of officers

	Height	Hand size A	Hand size B	Hand size C	Hand size D
Female officers	169cm	74mm	175mm	66mm	15mm
Female average	162.4cm [43]	78mm [44]	172mm	NK	NK
Male officers	182cm	85mm	196mm	72mm	21mm
Average male	175.9cm	89mm	193mm	NK	NK

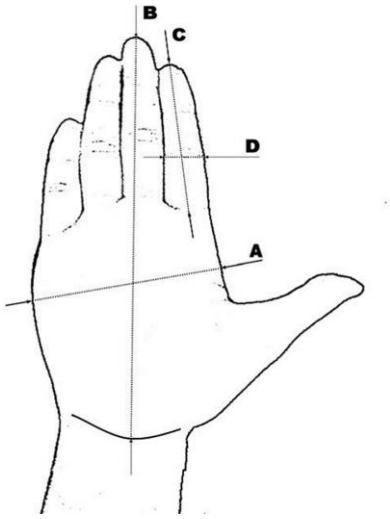


Table 35 shows the average height of the male and female officers who participated in the trial, along with their hand size. There is over 143,000[45] police officers in the UK. Whilst the sample size of 27 officers is small, comparing the cohort to the UK population average, they would appear to be broadly similar to the UK populous. Therefore, one could contend they are a reasonable representation of UK police officers too.

Relevant comments from female officers included:

> *Safety switch button rather small and fiddly* (X2 user)

[43] **Part 4: Trends - NHS Digital** [Accessed 14.12.23]
[44] **Average Hand Size For Men, Women, And Children (theaveragebody.com)** [Accessed 14.12.23]
[45] **Police workforce, England and Wales: 31 March 2023 - GOV.UK (www.gov.uk)**

I prefer the X2's re-energise/extend button over using the safety switch, due to having a smaller hand I sometimes struggled to maintain pressure up on the safety switch to preform [sic] the warning display/re-energise. …. The above criticisms are potentially down to muscle memory from being an X2 user. (X2 user)

As a new taser officer I found the taser easy to use… (new user)

As a new user of Taser and never handled one before, I found this device very easy to operate. I found the 'safety switch/selector' took some time for me to get used to, however I think this is just down to the device being new, as towards the end I found it much easier to operate.

I found it accurate and effective when in use. Easy to perform function checks.

Easy to place into covert mode. Overall a very good bit of kit. (new user)

Great bit of kit….I did find the Taser 10 heavy compared to T7 which was a negative. (T7 user)

I struggled to move the selector switch upwards to extend/re-energise the cycle. The shape of the switch presented me with resistance so I had to alter my grip on the device to achieve the outcome. (X2 user)

This device was easy to use for someone who hasn't handled one before….The accuracy was good with the laser but I struggled in stealth. This was maybe because of my lack of experience. Taser was easy to handle but handle/grip was quite wide for someone with small hands. Overall easy to use + I would feel confident with this device. (new user)

As a non-user I have felt I have been on-par with my fellow colleagues who are Taser users when it came to target accuracy and operational use. (new user)

Instructor survey

To address SR 31:

> *The system should be usable and readily trainable with minimal infrastructure implications (simple and intuitive).*)

All T10 instructors from the national practitioner group who assisted in UHT1 were anonymously surveyed using an online survey (n=10). They were asked to rate aspects of the devices in relation to how easy it is use/teach using a four-point Likert type scale:

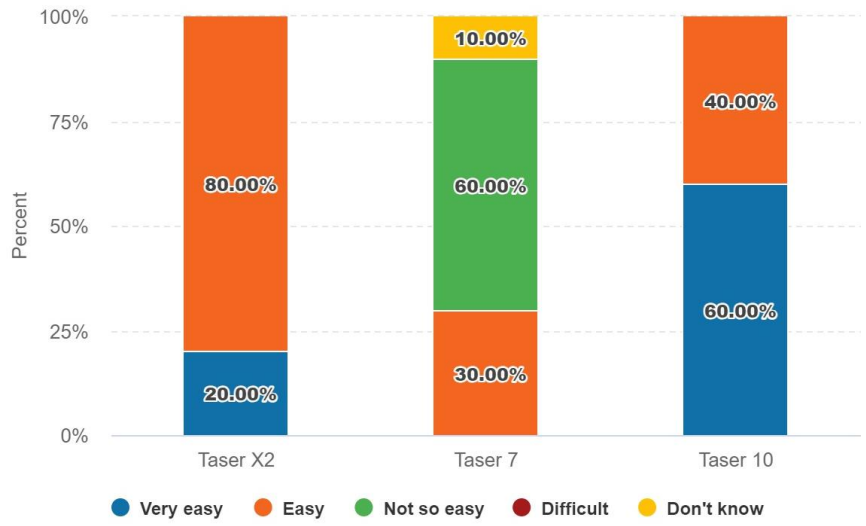
Very easy	Easy	Not so easy	Difficult

Question 10 uses a similar scale but from strongly agree to strongly disagree.

Question 11 requires them to 'rank' the devices in order.

The questions and associated comments were as follows:

1. **It's easy to teach officers to fire the device accurately.**



Comments:

Depending on the level of the student, but incorporating the principals of shooting are essential

the T7 trigger pull is awkward so introduces unnecessary weapon movement when applying the trigger, which at distance can make firing inaccurate.

The X2 is accurate but requires an officer to look at two aim points simultaneously, which when presented with a threat, can be challenging.

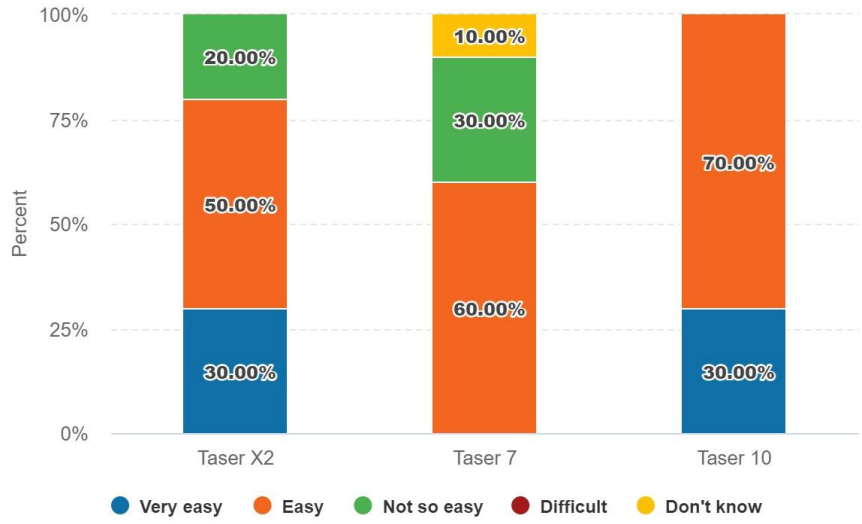
T7 trigger is harder to adapt to. T10 is probably easier than X2 as only single probe to consider and easy green laser to see as well as fixed sight more prominent than X2

X2, simple device – two lasers, roughly goes where they are.

T7 – more complex – SO/CQ running through the mind etc etc

T10 – pick where want.

2. **It's easy to teach officers to load or reload the device.**



T7 listed as easy as requires differing cartridges to be loaded dependent on the incident.

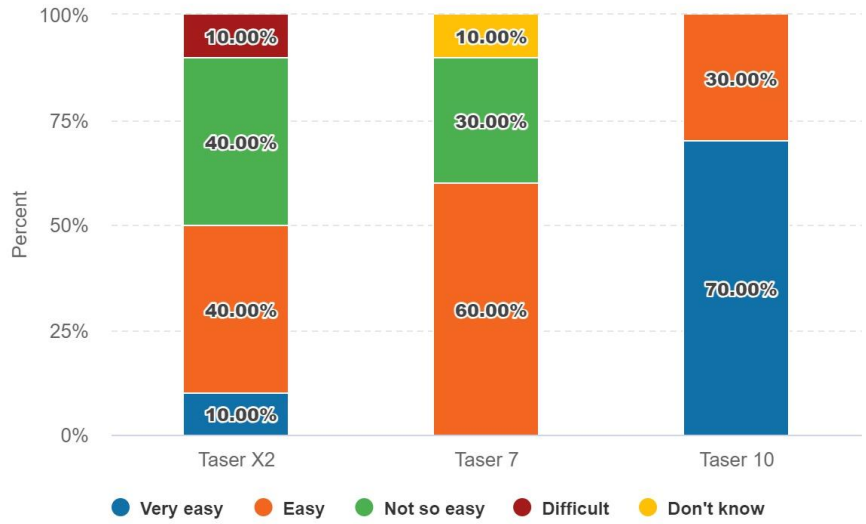
Magazine may be harder to remove from the T10 for some but the loading of the probes into the mag and mag onto device is easy

T7 – "sticklebricks".....can be difficult

T10 – 10 carts into a mag. Easy enough when explained

X2 – simple

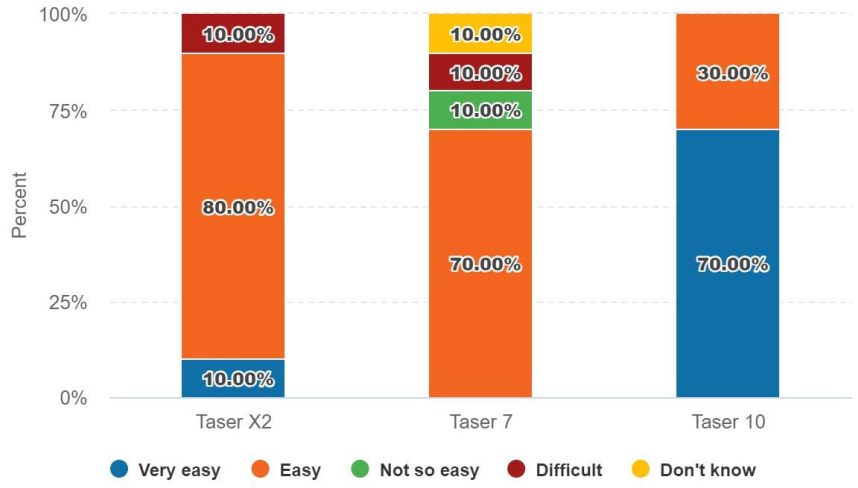
3. **It's easy to teach officers to perform a function check.**



X2 & T7 listed as not so easy as there are a number of steps for an officer to remember and all involve arcing, which introducing an element of discharging of the weapon (by way of arc display) T10 – does not involve any weapon manipulation, it is a system check which is very simple.

Simple with T10 as no arcing. X2 and T7 – more complex

4. **It's easy to teach officers to successfully deliver two probes on target.**



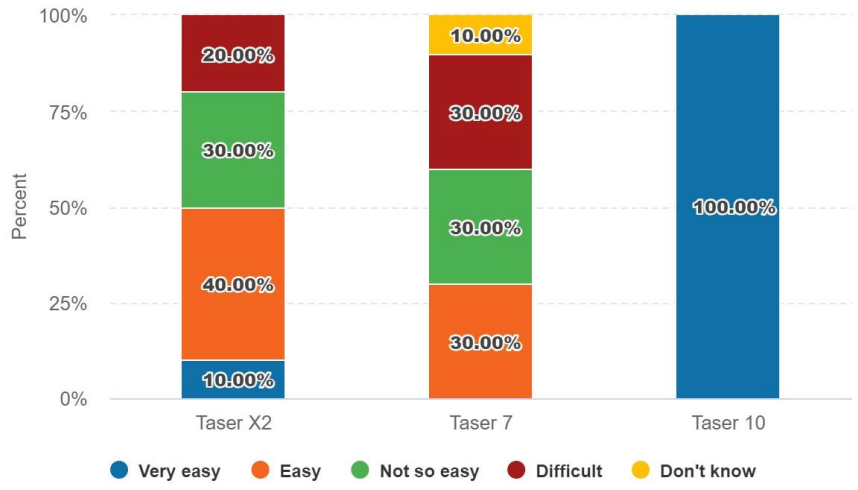
Taser x2 and T7 are very distance dependent, so if you are at the extremes of usage, it can make shot placement very difficult, if not impossible, especially if there is any subject movement. T10 being single shot means the officer can dictate shot placement whatever the distance.

T7 – officers have to consider use of different cartridges at varying distances but other than that all are relatively easy. T10 probably makes it easier to deliver two as you only have to concentrate on the single point of aim and not a second probe

Laser guides for X2 and T7 – T7 may cause more issues due to SO/CQ

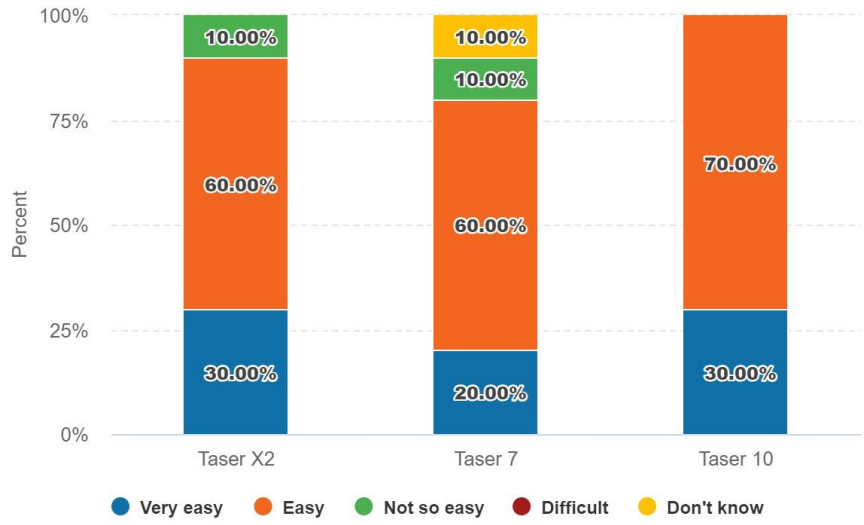
T10 – pick and go!

5. **It's easy to teach officers to successfully deliver two probes on target accounting for distance and probe spread requirements.**



T7 – consideration for varying cartridges at different distances

6. **It's easy to teach officers to extend or re-energise the cycle.**

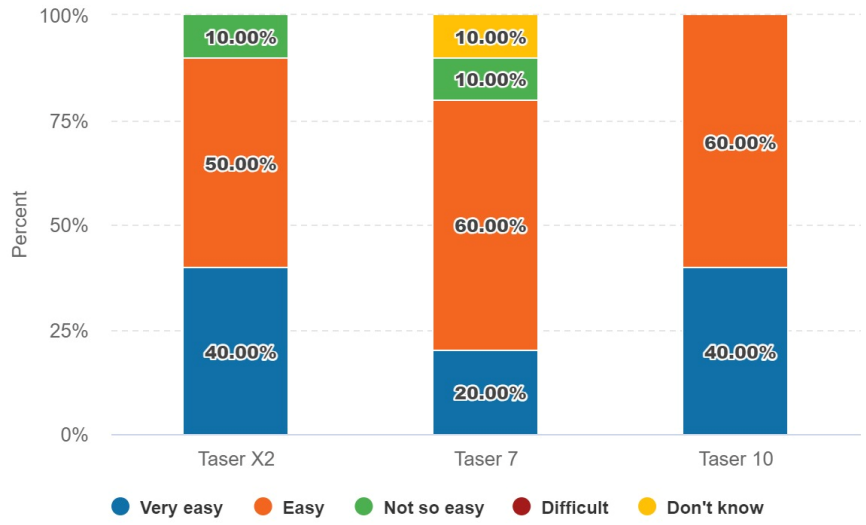


X2 & T7 – on the push of a button

T10 – movement of the safety

All simple with coaching.

7. **It's easy to teach officers to perform a warning display.**

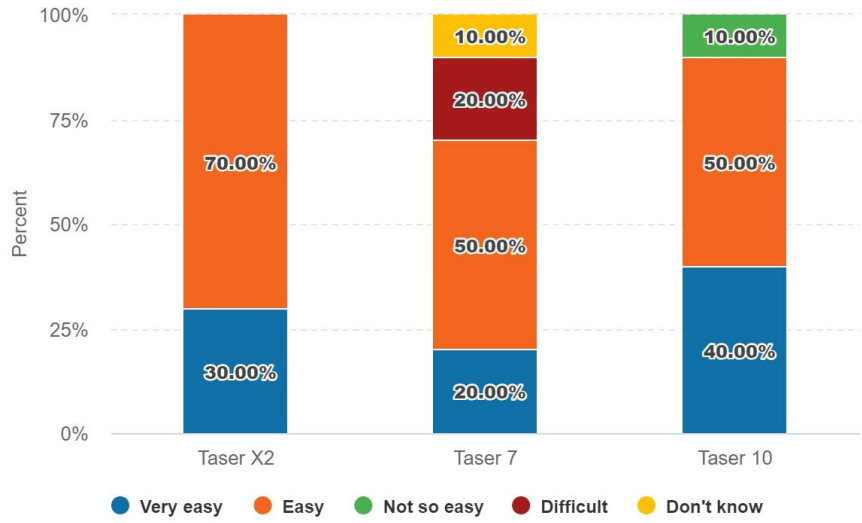


X2 & T7 – on the push of a button

T10 – movement of the safety – although on testing the T10 did appear to have an issue with a warning display with the officers moved the safety to swiftly.

All simple with coaching.

8. It's easy to teach officers to manipulate the safety/selector lever.



T7 is slightly trickier than the other devices

size of the officer dependent.

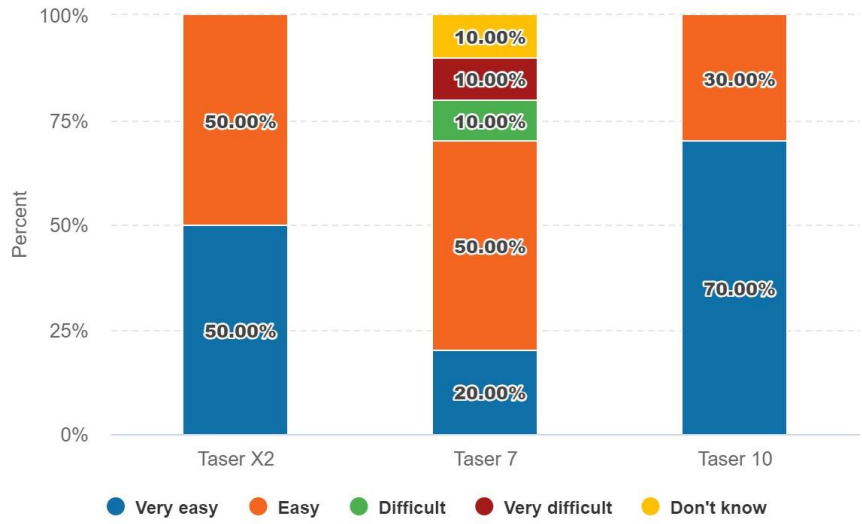
If the officer has smaller hands the T7 is difficult to handle.

The x2 and T10 are easier to manipulate, however t10 does require the instructors to look at the officer as an individual and tailor their grip / safety manipulation to their body mechanics.

T10 has more options to consider. X2 and T7 are just on/off, but still easy

Functionality of T10 safety – sees people doing all sorts of things!

9. It's easy to teach officers to operate the trigger.

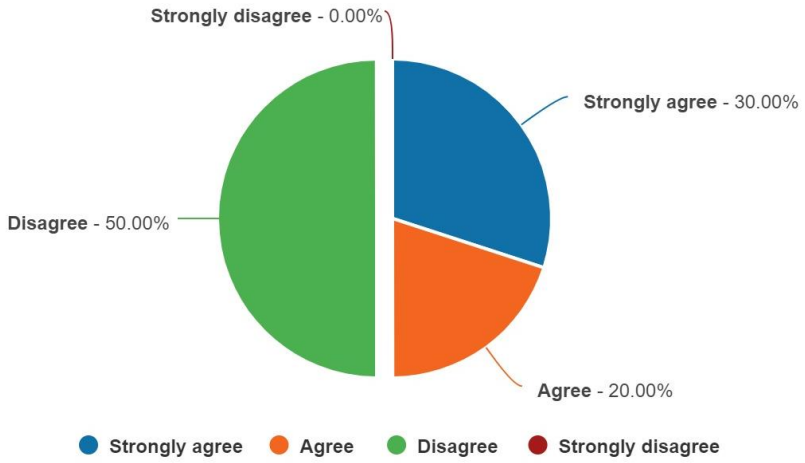


Again, T7 is a pressure pad than a trigger

T7 less easy due to the trigger being more stiff so invokes unnecessary weapon movement.

T10 trigger is a big improvement on the T7. T7 is probably harder to deal with than X2 due to the nature of the microswitch/rubber button

10. Given the Taser 10 could be fired up to (13.7m) 45ft, it would have minimal infrastructure implications. (Consider whether your current facilities could accommodate distances up to 12m).



firearms training venues will probably already accommodate this due to using weapons at distance. However STO training venues may require change due to the increase in distance.

Our current range is 7m deep and 12.5m wide. We normally run 8 lanes across the 12m width and we would need to turn the range 90deg in order to accommodate distances up to 10/12m, with only 4 lanes, but 12m would be a squeeze.

Would need to spend more time, split groups, turn ranges round etc

however moving to new venue which would accommodate next financial year

11. In terms of how easy and intuitive the devices are to use and therefore for you to teach students, rank the devices in order best (1) to worst (3).

Device	Score[46]	Rank
Taser 10	28	1
Taser X2	19	2
Taser 7	13	3

Comments:

I don't personally like the cartridge changing element of the T7, I think it gives an officer another layer of decision making in the midst of a dynamic and ever evolving incident, where their main focus should be on threat and risk.

T7 trigger and swapping cartridge types make it harder for some to deal with

[46] Score is a weighted calculation. Items ranked first are valued higher than the following ranks, the score is a sum of all weighted rank counts.

Analysis of results vs. system requirements

The user handling trial set out to consider the following system requirements (SR):

- **SR3** A suitably trained officer should be able to hit a static person sized target with a minimum of two probes over the defined operational range.
- **SR4** In the event of failing to subdue the subject (or the subject breaking free) the system should be able to fire further probes without reloading to attempt incapacitation.
- **SR8** The system must be effective against a moving target within the operational range if the officer manages to obtain contact with the probes.
- **SR11** The system should be able to provide gradual escalation of force through a variety of means.

Each system requirement has a 'measure of performance' (MOP), set out in the system requirement document[47], against which each SR needs to be assessed. This has two levels, a 'threshold' (minimum) which a system must meet, and an 'objective' which is a level that is desirable.

SR3

SR3 requires that: *"A suitably trained officer should be able to hit a static person sized target with a minimum of two probes over the defined operational range."*

The MOP is defined as:

- **Threshold-** The hit probability of both probes should be greater than 75% over representative operational ranges.
- **Objective-** The hit probability of both probes should be greater than 90% over representative operational ranges.

Breaking down each element of SR 3: All officers participating in the trial were 'suitably trained' sufficient to undertake the trial. The handling trial considered a

[47] NPCC, Conducted Energy Devices, System Requirements Document, v1.5, 24.4.23

number of exercises from 3m to 13.7m. Training in extant CEDs is up to 4m and SR1 refers to a threshold range of 2.1-4.5m.

Axon state the T10's maximum 'effective' range is 40ft (12.2m).[48]

The T10 was found to be highly accurate and have a high level of redundancy should officers miss, given it has ten shot capability. Its accuracy was consistently better than extant devices.

Based on the data analysed in exercises 1 to 5 above, then it would be reasonable to conclude the threshold of 75% has been exceeded at all distances up to 10m when using the laser sight.

Considering exercise 2A (10m with laser sight) 88.9% of shots were less then 150mm from POA to POI, and 75.3% of shots were less than 100mm (see table 11).

At 5m (exercise 2), where using the laser sight, 100% of shots were less than 150mm POA to POI and 98.8% less than 100mm (see table 10).

Recognising these exercises were essentially a static accuracy test, exercise 7 was more dynamic and operationally relevant, and considered the wider utility of the system, e.g. follow up shots. Miss rates for the T10 were 1.9% during this exercise, giving hit probability in excess of the 90% objective MOP.

Considering the fixed sights at 5m (exercise 3) 91.3% of first shots were less than 150mm from POA to POI and 93.8% of second shots were less than 100mm (see table 14). This also exceeds the objective MOP.

However, the practical accuracy of the device at 10m using fixed sights, whilst for some more experienced users was within the threshold MOP, this was not observed consistently across the cohort (see table 15).

In summary these data indicate that the T10 met the threshold (75%) MOP for SR3 using laser sights up to 10m, and met the objective MOP, using either sight up to 5m. Its performance in this regard was consistently better than extant devices.

[48] Axon_T10_Instructor_PowerPoint_0523_en_US, slide 55, 1st May 2023

SR4

SR4 requires that *"In the event of failing to subdue the subject (or the subject breaking free) the system should be able to fire further probes without reloading to attempt incapacitation."*

The MOP is defined as:

- **Threshold –** Second opportunity immediately available.
- **Objective –** Three (or more) opportunities immediately available.

Exercise 5 and parts of exercise 7 required the officers to deliver further probes, without reloading, simulating the initial two shots failing to achieve incapacitation.

Considering exercise 5, when compared to the X2 and T7, the T10 delivered six probes in a mean time of 5.5s, without reloading. This compares to 12.8s for the X2 and 9.3s for the T7, which of course required a reload after the first two cartridges/four probes. Not only that, T10 was more accurate despite the officers delivering the probes at a faster rate.

Given all officers were able to deliver six probes rapidly (creating at least five opportunities to create incapacitation) and accurately it is fair to conclude the T10 has exceeded the objective MOP.

SR8

SR8 requires that *"The system must be effective against a moving target within the operational range if the officer manages to obtain contact with the probes."*

The MOP is defined as:

- **Threshold –** Operational effectiveness of first probe pair firing to be at least 50%.
- **Objective –** Operational effectiveness of first probe pair firing to be at least 75%.

Whilst exercise 6 did have a moving target, it was directly towards the officer, so the impact on accuracy was limited. Exercise 7 was far more dynamic and operationally realistic in this regard, as it involved engaging role players who were behaving in a

realistic manner conducive to the scenario. This involved a degree of movement in different directions.

In exercise 7 the miss rate for the T10 was 1.9% and the mean probe spread was 45.8cm. Both parameters would indicate that high effectiveness rates, in excess of the objective MOP, could be expected based on these data.

It should be easier to deliver a probe against a moving subject with the T10, in comparison to existing CEDs, due to probes being delivered singularly.

However, accuracy and probe spread are not the only factors that influence 'operational effectiveness'. The T10 is a low voltage device that can no longer arc across air gaps, and probes must be in the skin. The T10's effectiveness in delivering probes into the skin, in order to produce neuro muscular incapacitation, is beyond the scope of this research and may be better address in technical or other scientific analysis.

SR11

SR11 requires that *"The system should be able to provide gradual escalation of force through a variety of means."*

The MOP is defined as:

- **Threshold –** The system should support officer activated de-escalation/escalation by differing modes of use, including:
    - The device being visible to a subject when pointed at them.
    - Having a sighting system that is visible to the subject and demonstrates they are being targeted.
    - Provides a visible and/or audible demonstration of potential effects.
    - The delivery of electrical effect.
- **Objective –** The system has more than four different levels of force as part of an escalation of force and demonstration of intent.

The threshold largely mirrors how APP[49] defines use of CEDs

> *The term 'use' includes any of the following actions carried out in an operational setting:*
>
> - *drawing the device in circumstances where any person could reasonably perceive the action as a use of force*
> - *sparking of the device, commonly known as 'arcing'*
> - *aiming the device or placing the laser sight red dot onto a subject*
> - *firing a device so that the probes are discharged at a subject or animal*
> - *application and discharge of a CED in direct contact mode (including three-point contact) and angled drive stun modes*
> - *discharged in any other operational circumstances, including an unintentional discharge*
>
> *The above may be used in conjunction with communication and de-escalation techniques.*

Considering the T10 system against the threshold SR:

- The device being visible to a subject when pointed at them.

The device is predominantly bright yellow in colour and a similar form factor to existing CEDs. It is clearly visible and of a consistent design with extant CEDs, so should be readily recognisable as a 'Taser'.

- Having a sighting system that is visible to the subject and demonstrates they are being targeted.

It is also fitted with a projected laser sight system that would be visible to a subject in most lighting conditions, broadly consistent with the X2 and T7.

- Provides a visible and/or audible demonstration of potential effects.

[49] **Conducted energy devices (Taser) | College of Policing**

As previously described the T10 can no longer deliver an arc display and makes use of an artificial audio/visual warning display. Some officers within the test group expressed some doubt as to the probable effectiveness of this warning display. Whilst the T10 does have this feature, and meets the requirement, its potential effectiveness is yet to be established.

- The delivery of electrical effect.

As explained above in relation to SR3, SR4 and SR8, the T10 was found to be accurate in delivering probes, with effective probe spreads. With the same caveat as articulated in relation to SR8 the device would appear to meet the requirement in this regard.

It is therefore reasonable to conclude the threshold MOP would be met by the T10.

The objective MOP requires more than four levels of force. Clearly it has the basic four (recognition/presence, aiming/laser doting, warning display and discharge), however, it can no longer deliver an electrical effect in any type of direct contact mode (drive stun). Therefore, a fifth mode is not available, and it does not meet the objective MOP. However, it is important to recognise that direct contact mode is a technique with limited effectiveness that attracts significant criticism and is a technique that is no longer actively included in training. In addition, three point contact may be employed by a X2 or T7 user when they have discharged their two cartridges and still not achieved NMI, whilst the T10 on the other hand has far more redundancy in probe mode, making such a feature potentially obsolete.

In removing a direct contact mode feature it means the T10 does not meet the objective MOP, where existing devices may do so. The absence of direct contact mode may actually be an advantage in some respects.

It is difficult to envisage what further use of force options would be available from a handheld CED to meet the objective MOP, other than those discussed.

Table 36, summary of system requirements and conclusions

SR ID	System requirement	Measure of performance (MOP)	
		Threshold	Objective
SR3	A suitably trained officer should be able to hit a static person sized target with a minimum of two probes over the defined operational range.	Met (Up to 10m with laser)	Met (up to 5m)
SR4	In the event of failing to subdue the subject (or the subject breaking free) the system should be able to fire further probes without reloading to attempt incapacitation.	Met	Met
SR8	The system must be effective against a moving target within the operational range if the officer manages to obtain contact with the probes.	Met*	Met*
SR11	The system should be able to provide gradual escalation of force through a variety of means.	Met*	Not met**
	*Limited to accuracy and probe spread. See caveats and limitations. **Removal of direct contact. See caveats and limitations.		

Considering the other system requirements, whilst not fully considered by this trial and analysis, some indication can be provided as to whether the T10 may meet such requirements.

Those additional SRs were identified as:

- **SR1** The device should have an effect against a subject at range.
- **SR10** The targeting system should be usable with either eye (dominant/non-dominant).
- **SR12** The system should be capable of being operated by an individual officer using either hand.
- **SR17** The system should temporarily neutralise the threat with reliability through NMI rendering the subject incapable of carrying out their intended action.
- **SR19** The system should not adversely affect or impair the user (officer) during use without any need for additional PPE.
- **SR29** The system should be reliable in use and function as expected when activated.

- **SR30** The system should have a self-checking mechanism with integrated self-diagnostics to confirm that the system is working to specification with confirmation to the user.
- **SR31** The system should be usable and readily trainable with minimal infrastructure implications (simple and intuitive).

SR10

SR10 requires that *"The targeting system should be usable with either eye (dominant/non-dominant)."*

The MOP is defined as:

- **Threshold –** The system should be useable by at least 95% of candidate trainees.
- **Objective –** The system should be useable by 100% of candidate trainees.

The cohort included both officers who were left and right eye dominant. It also included officers whose dominant eye was opposite to their dominant hand, and those where it was the same.

No adverse outcomes were identified in relation the dominant eye and hand and the device would appear operable by users irrespective of such characteristics.

SR12

SR12 requires that *"The system should be capable of being operated by an individual officer using either hand."*

The MOP is defined as:

- **Threshold –** The system should be useable by at least 95% of candidate trainees.
- **Objective –** The system should be useable by 100% of candidate trainees.

In common with the X2 and T7, the user interface between a T10 and the hands is symmetrical in design along the vertical axis (from a user's perspective when held). The selector switch is duplicated on both sides of the CED, and the trigger is operable with either hand. It is therefore ambidextrous in operation.

No adverse outcomes were identified in relation the dominant hand and the device would appear operable by users irrespective of such characteristics.

SR17

SR17 requires that *"The system should temporarily neutralise the threat with reliability through NMI rendering the subject incapable of carrying out their intended action."*

The MOP is defined as:

- **Threshold –** Effectiveness that meets level of current X2 device.
- **Objective –** Effectiveness that exceeds level of current X2 device.

Whilst this report cannot consider the effectiveness of the NMI the electrical output of a T10 may produce, it can give an insight in to some of the preliminary steps required to create NMI. They would include accurate delivery of probes relative to the officer's point of aim, and the creation of sufficient probe spread. Both factors are explored above extensively and the T10 would appear fit for purpose in this regard and offer some advantages over extant systems. However, the impact of the different wave form and the ability of the probes to reach the skin is beyond the scope of this research.

It may be that data on effectiveness can only be truly established once deployed in the field and the subject of relevant data gathering. This is a process previous new systems have been subject to. Field data from other countries where T10 is in operational use may also assist.

SR19

SR19 requires that *"The system should not adversely affect or impair the user (officer) during use without any need for additional PPE."*

The MOP is defined as:

- **Threshold –** No additional PPE.
- **Objective –** No additional PPE.

During the user handling trial, a significant number of cartridges (in excess of 4000) were fired by over 27 users. No adverse effects were observed or reported by the cohort.

Whilst officers wore protective eyewear (as is standard practice for training in CEDs and firearms) for the trial, this is not required for the primary effects of the T10. It more relates to the potential ricochet hazards prevalent in a training environment.

SR29

SR29 requires that *"The system should be reliable in use and function as expected when activated."*

The MOP is defined as:

- **Threshold –** 95%
- **Objective –** 99.9%

Reliability is discussed extensively above. (See **Reliability**)

SR30

SR30 requires that *"The system should have a self-checking mechanism with integrated self-diagnostics to confirm that the system is working to specification with confirmation to the user."*

The MOP is defined as:

- **Threshold –** feedback that no faults are detected
- **Objective –** as threshold

The T10 device does feature a 'functional test mode' that provides a self-checking feature as required by SR30. Most officers found this easy to operate and clear results are provided on the central information display.

However, several faults did occur that were not identified by the self-checking procedure. It is not possible to identify whether these faults only occurred after the function test was carried out, whether the process failed to identify them or they were outside the scope of the function check.

This may be an area that can be considered further during technical testing.

SR31

SR31 requires that *"The system should be usable and readily trainable with minimal infrastructure implications (simple and intuitive – look for COP/OJP opinion)."*

The MOP is defined as:

- **Threshold –** Technical manuals available and a train the trainer programme, to tier 3 providers, suitable for UK use.
- **Objective –** As threshold

The broad consensus of the officers and the overwhelming view of the instructors would indicate the T10 is usable (simple and intuitive) and readily trainable. Axon has a well-established 'train the trainer' programme, which the College's instructors have attended to facilitate this trial.

Axon provides comprehensive training material for the T10, consistent with that provided for previous devices.

If the device were to be trained in the same fashion as extant devices, then it would indeed have 'minimal infrastructure implications', as the existing infrastructure could be used without any significant changes.

However, of the limited number of forces surveyed initially, via the practitioner group (n=10), were the device to be trained to 10m for example, then 50% of those forces may have infrastructure implications. This is mainly because current CED range facilities typically accommodate firing up to 4 to 5m. Whilst some of them may be reconfigured and used 'side on', this can have the net effect of reducing capacity and therefore throughput during training. For example, the Humberside Police facility used for the trial can accommodate up to nine students firing simultaneously, when reconfigured (side on) this is reduced to four. This could potentially mean that it would take longer to train officers at 10m.

During a routine unrelated Teams meeting with chief Taser instructors from across the UK, they were polled to ask whether they could fire at 10m in their current facilities, the available answers being yes, no or maybe (i.e. with some reconfiguration) (n=27). They answered as follows:

- Yes 11 (40%)

- No 11 (40%)
- Maybe 5 (18%)

They were also asked what the maximum distance they could currently fire at (n=30)

- 4m 5 (16%)
- 5m 3 (10%)
- 6m 2 (6%)
- 7m 3 (10%)
- 8m 3 (10%)
- 10m 12 (40%)

As can be seen from above, some forces may be able to accommodate firing at 10m, or find somewhere within their facilities that could accommodate 10m, thus having little impact. Equally some forces may not have such a facility.

The distance at which officers train with a T10 needs further discussion to consider more fully the needs of policing. To simply train to 10m because the device is capable of it would seem illogical in the absence of an operational need. However, to not explore the device's full potential would be equally remiss. Such decisions should not be based on the capabilities/limitations of training facilities, they should be led by the operational requirements within the capabilities of the system.

In addition, such a requirement could depend on the role of the officer, where some may require such a capability where others do not.

The options that such a discussion may wish to consider include:

- All officers trained and assessed up to 10m.
- All officers trained and assessed up to 8m.
- All officers trained and assessed up to 5m.
- Most officers train to 5m, with certain identified roles (e.g. those in armed policing, who typically operate further away) trained and assessed up to 10m.

- Two standards exist 5m and 10m, and forces identify through their CED strategic threat and risk assessment process which roles require which standard.

Ultimately this decision will inform the College's standards, training and curriculum design ensuring it meets the operational requirements of policing.

An option is included at 8m, as this is close to the mean distance officers engaged a subject at during exercise 6 where a subject was closing them down from 15m.

Axon also have a virtual reality training system that includes exercises over the full operational range of the device. This may offer a partial solution but has not been explored or tested at this juncture.

Conclusions

The College of Policing were tasked by the Home Office to conduct a user handling trial of the TASER® 10™ conducted energy device. This trial considered the performance of the device from a users' perspective in comparison with extant devices (TASER® X2™ and TASER® 7™).

A cohort of 27 police officers from nine different police forces/agencies undertook the initial trial (UHT1). Two further trials were conducted (UHT2 and UHT3) to consider reliability issues as Axon made amendments to the system. In total this assessment has considered the performance of 42 T10 devices firing in excess of 4500 cartridges, over the course of 11 discrete exercises.

Accuracy and consistency

The T10 proved to be more accurate than extant CEDs, with both the laser sight and fixed sights. This may be as result of improved intrinsic accuracy, aided by the relatively low complexity of aiming one probe at a time.

Given single probe delivery, one could contend it is far easier to deliver probes to subjects in a supine, or other unconventional posture, than with the fixed probe spread of extant systems.

The T10 can deliver probes rapidly and accurately. Should the first four probes fail in their attempt to create incapacitation, an officer with a T10 can swiftly deliver further probes, where their colleagues with an X2 or T7 would have to reload.

The T10 had a low rate of missed shots. The rate of shots to sensitive areas was low and similar to extant devices.

The ability of the T10 to be used accurately from increased ranges, compared to extant devices, may mean that officers can, where circumstances permit, engage with a subject at an increased distance. It is possible such an ability may aid de-escalation, as giving the subject 'space' is a key facet of such strategies.

User and instructor survey

The participants were surveyed to capture their thoughts in relation to T10 in comparison to their existing device. Generally, most officers preferred the T10 to

their existing device when considering most aspects. The two areas that did generate some comment was the potential effectiveness of the simulated warning display in lieu of the conventional arc display and multi-function aspect of the T10 selector switch.

The T10 can no longer produce a conventional arc display and uses a strobe light and audio alert to simulate such a display. A significant number of officers expressed doubt as to the potential effectiveness of this simulated warning display.

In addition, the selector switch of the T10 now combines the functionality of both the safety switch and arc button of the X2 and T7. This was not universally popular, with some officers preferring the existing two button arrangement. However, this may be something that improves as officers become more familiar with the device.

Instructors were also surveyed and overall, their views of the T10, from a training perspective were positive, with most considering it an ‘easier’ device to train officers in, particularly given the low complexity of aiming probes singularly.

Impact of personal characteristics

The impact of personal characteristics was considered during the trial including sex/gender of the officer, their dominant hand and eye, and physical characteristics such as height and hand size.

Inevitably with a ‘one size fits all’ device there were some comments that the grip of the device was too small or too big, but despite this all the officers were able to operate the T10 safely and accurately.

Reliability

It is fair to say that reliability of the T10 system has been on somewhat of a journey throughout the evaluation. Communication with, and action by, Axon has seen progress in the reliability of the system. A reduction in critical faults from 4.3% (UHT1) to 3.3% (UHT2) and ultimately to 1.9% (UHT3) was observed over the course of this assessment.

Other faults have also reduced but still persist to some degree. Including warning alerts beyond the expected time frame and CID misreads.

Warning tones that continue beyond the expected timeframe, particularly a connection alert, could present confusing information to the officer. However, officers are trained to operate a CED based on analysis of threat and the resulting subject behaviour change the CED produces.

Whilst CID misreads have been improved from 11.9% in UHT2 to 1.9% in UHT3 they still do persist. Whilst a sixfold improvement is welcome, there remains room for further development. In addition, it should be noted during a deployment, similar to the above, the officer should not be concentrating on the CID, rather they should focus on the subject/threat. Therefore, this is unlikely to have any significant operational impact during its deployment.

The reliability of revision B T10 devices with firmware version 1.4.9 was the system most free of the more serious faults and issues.

Overall

The T10 system is possibly the most significant change in the design and operation of CEDs since their introduction into the UK in 2003. The increased range, accuracy and multi-shot capability are considerable enhancements. The removal of the contact mode (drive stun) would also be welcomed by many stakeholders.

The ability of the officer to be more selective with both probe location and spread is also likely to be a significant change that, where supported with thorough training, should improve outcomes.

It is also possible that the T10 offers a lower flammability risk given that it can no longer arc through the air to any great degree. However, it is beyond the scope of this assessment and the authors expertise to assess this with any degree of reliability. Such an assessment may require specific scientific knowledge.

At the time of writing technical testing is yet to be conducted but the probes' ability to reach the skin as required by this system should be a point of focus.

Although reliability has improved, if adopted, reliability should continue to be monitored and improved.

(See also key finding 15, page 160)

Recommendations

This user handling trial assessment has been conducted by the College of Policing on behalf of the NPCC (LLW) and Home Office, against the documented system requirements.

Whilst a summary has been provided against those system requirements and a view offered, it is not for the College to determine whether those requirements are met. It is recommended the NPCC review this report to consider whether the Taser 10 system meets the system requirements. Particular consideration should be given to the extensive testing in relation to reliability.

No system is ever going to be perfectly reliable, and users of any device need to have contingencies for operational failures. Whilst some faults are of a minor nature, that may not have a significant impact on performance, they can impact confidence in a system. In reviewing all the available information and data, it is recommended the NPCC and Home Office consider the system's potential reliability in an operational setting and satisfy themselves they fully understand both the nature of those potential issues and their implications, including any residual risk, in reaching a decision on whether to approve the system.

In addition, given the 'agency settings' can change how the system may operate, in common with T7, they should be subject of specific direction to forces.

It is recommended that the Home Office Science Commissioning Hub consider this report in defining any further technical assessment or testing. Areas that may be of particular interest is the ability of T10 probes to penetrate clothing and engaging the skin and the consequences of probes reaching the full extent of their wire and resulting performance of the probe.

It is recommended Dstl review this report to inform any assessment of the T10 system they wish to provide to SACMILL.

It is recommended that SACMILL review this report to consider their medical statement.

The College can provide further assistance should it be required in supporting such reviews and recommendations.

If the T10 system is to be adopted in the UK, it is anticipated it would be subject to enhanced monitoring and data recording that has followed the introduction of new CEDs in the past. It is recommended that the fault types, and their associated symptoms, identified in this report are included in instructor and technician training and inform user training. In addition, the T10 should be subject to a robust process that shares experience so such issues can be monitored, awareness raised, and solutions shared amongst all T10 forces/agencies.

It would also be advisable for Axon, as the supplier and manufacturer, to continue to engage in this process to maintain and improve a culture of continuous improvement and enhanced reliability of their products.

It is also recommended that, should the T10 system be adopted, Axon consider the contents of this report and work with relevant police stakeholders in improving the system. Specific points made in this report they should consider are detailed below.

- (Page 37) It would be desirable if the cartridge and probe serial numbers corresponded to one another to make them more readily auditable.
- (page 116) … the red inert magazines produce a connection alert randomly between two and five cartridge deployments to simulate an operational deployment. It may be beneficial if Axon considered a similar approach to blue HALT magazines to enable the full functionality of the device to be explored in scenario based training.
- (Page 150) It would appear the issue of exporting accurate PDF copies of device logs remains unresolved at this juncture, although it does appear to have improved.
- (Page 153) It would be beneficial if the Axon Evidence platform both flagged where a bore failed to fire to the system administrator/Taser technician, and made such an event a searchable parameter within the application.
- (Page 157) It is noted that this information, i.e. it is loaded with ten cartridges, does not appear on the device log until the device is subsequently armed. It would be of benefit if this information also appeared in the function check device log entry.

- (Page 159) Whilst CID misreads have been improved from 11.93% in UHT2 to 1.85% in UHT3 they still do persist to some degree. Whilst a sixfold improvement is welcome, there remains room for further development.

The College will consider this report, and any other testing commissioned in relation to the T10 system, in the preparation of any training material for the Taser 10 system should it be approved by the Home Office for use in the UK. In addition, the College will review and update APP where appropriate changes are required.

Specifically, the College will also consider the following in the development of training:

- The need for probes to be in the skin to create effective NMI and the training strategies to support this concept.
- The ability to operate from increased range and the possible benefits this may realise in de-escalating incidents.

As was observed with Taser 7 probes can detach at full extension of the wire and may present a hazard in such circumstances. The T10 has not been evaluated in this regard. It is recommended that such information is sought from Axon, or subject to technical evaluation to understand the performance of the T10 probe at full extension of the wire.

Caveats and limitations

- The evaluation of the Taser 10 by the College has considered it as a system rather than just a device, commensurate with the requirements of The Code.
- UHT1 considered revision A T10 devices operating on firmware 1.2.0, UHT2 considered revision A devices operating on firmware 1.3.0 and UHT3 considered revision B devices operating on firmware 1.4.9. The results expressed in this assessment are valid for the relevant device revision and firmware. However, they may not be valid for future revisions or firmware updates.
- Axon have released a further firmware update 1.5.3 (see Appendix 5 for relevant Axon bulletin). Whilst this has not been formally tested, as it post-dates the user handling trial, the College has updated its stock of devices and

used them in training preparation and has not observed any adverse outcomes. The device now alerts a user where the battery has not been docked for 30 days, which is a welcome addition.

- This evaluation considers the system from a users' perspective, in the form of a user handling trial. It is not a technical evaluation. The technical evaluation is to be conducted by an appropriate body appointed by the Home Office.
- This report is not intended to decide on the suitability of the Taser 10 system for use in the UK, but rather inform such a decision which clearly rests with the NPCC and ultimately the Home Secretary.
- The accuracy tests within exercises 1 to 5 were static hand fired in a standard range environment. This allowed accuracy to be measured consistently. However, many of the external factors and stressors that may affect accuracy in operational circumstances would not be included. They were present to some degree in exercises 6 and 7.
- Whilst this assessment has considered the accuracy of the T10, the impact of the different wave form and the ability of the probes to reach the skin is beyond the scope of this research.
- The T10's effectiveness in delivering probes into the skin, in order to produce neuro muscular incapacitation, is beyond the scope of this research and may be better address in technical or other scientific analysis.
- No significant issues were identified with the T10 system for female offices. Accepting the physical differences between men and women, it is beyond the scope of this report to explore this as a potential influencing factor, whilst isolating others, with any degree of reliability when analysing accuracy data.

Acknowledgements

Significant support and assistance was provided to the College in undertaking this user handling trial and analysing the resulting data. It could not have been completed without such help.

Thanks is extended to NPCC Less Lethal Weapons Administration Team. The support and hard work of <REDACTED> in data gathering and analysis, and the preparation of graphs is greatly appreciated. Thanks, is also extended to Sgt <REDACTED>, for logistical support in coordinating the officers to participate in the trial.

The trial could not have been conducted without the support of the Taser instructors of the National Practitioner Group, who provided support in training the officers in T10 and ensured the safe conduct of the trial. The authors also wish to extend their gratitude to their force(s) for releasing them for the trial.

Particular thanks is expressed to Gwent Police and Humberside Police for the provision of their training facilities and releasing officers to participate in the trial.

Thanks is also extended to Dstl, Home Officer Commissioning Hub and <REDACTED>, as the project lead, for their support in the design and conduct of the trial.

The support of the forces who released officers is also greatly appreciated. This trial was undoubtedly enhanced by the diverse number of forces that released officers.

And finally, to the officers themselves for their patience and commitment throughout the trial.

Appendix 1 – Participant comments in full

Taser 10

Officer 1 (X2 user male)

"I really liked that this Taser has 10 cartridges.

I think it will be great for when the subject is close

I don't think the warning display is as effective as the X2. I prefer the ""crackle"" of the X2

Overall I think the Taser 10 is far better than the X2."

Officer 2 (X2 user female)

"Warning noise is rather childlike (like a toy)

Safety switch button rather small and fiddly

Noise overall - limited and hard to hear if probe has connected

Like that probe placement is up to individual and that it is effective from far away/close up. 10 cartiridges are a plus compared to X2.

Issue if 1 cartridge is fired and subject complies - no connection made however where does this leave you with use of force"

Officer 3 (X2 user female)

"I don't feel as though the warning display is as effective as the Z2's 'ARC DISPLAY'

I prefer the X2s's re-energise/extend button over using the safety switch, due to having a smaller hand I sometimes struggled to maintain pressure up on the safety switch to preform [sic] the warning display/re-energise.

I think it is more difficult to determine when a good connection has been made; the beeping isn't as effective as the crackle on the X2

I much prefer the option to fire 1 cartridge at a time as it allows for much more accurate & effective shots,

Overall I feel as though the Taser 10 is a much better device and all the above criticisms are potentially down to muscle memory from being an X2 user."

Officer 4 (X2 user male)

"Q7. SELECTOR/SAFETY SWITCH - This component is slightly too small - a larger switch (3-4mm) would make a better positive warning display easier to operate. At present the small switch (and quite stiff action) made performing the display difficult.

The safety switch should be the safety switch only i.e. a downward pressure should only be for safety and not to perform the check function (this could be performed with a seperate button?)

Q.13 As a user with larger hands, I found that my little finger slipped under the handle and I didn't have a positive grip when performing warning display.

Q.18 - As per Q7 reply.

The safety (return to safety) switch should be a standalone downward action (as with an X2 Taser) If the operator, with the drawn Taser is in a high adrenaline, operational environment, could reply on a single downward thumb action, I believe they would have more confidence that the device was safe and no unintentional discharge could occur (and that the device could not activate a safety check function)."

Officer 5 (X2 user male)

"Q7. The safety switch is easy to operate as a conventional safety. The only issue I found was when doing a warning display, where the switch has to be pushed all the way up was awkward in compation to X2.

Found this difficult using the arming thumb while being preppared [sic] to fire the device."

Officer 6 (X2 user male)

"Q5 - The carts can be a bit fidldy to unload but not impossible, maybe a multi load/unload device could be created?

Q7 - Not as easy as the X2 however I think this is due to its placement on the device

Q9 - I think the 'principles of shooting' would need to be taught in conjunction.

Q13 - The pistol grip feels a little short when drawing and using”

Officer 7 (X2 user male)

"The device in general is extremely good. The option to use it in confined spaces/short/long distance is very positive in operational policing. The ability to select what muscle groups to shoot at increases the chances of achieving NMI and (?) reduces risk to officer/subject public.

Cons - the selector switch was difficult to use in relation to warning display due to small thumbs. Switch could be bigger. After firing it would benefit from the ""arcing sound"" of the X2.

Warning display does not seem as effective as the X2 ""arc display"".

Overall the device would benefit day to day policing."

Officer 8 (T7 user male)

"Q1. The device during my time of handling, I would say is accurate in repsect of aiming at fighting age persons. On occasion, barbs appeared to differ slightly. There is one laser but 10 cartridge bays. The bays situated in the top corners and to the side, what effect that has on shot placement in respect of the laser/fixed sights is something to be tested further.

Q8. I had no issues in operating the selector lever however those with smaller hand/thumb sizes may have difficulty in engaging the warning display function for a prolonged period of time.

For covert roles, to minimise compromise, I would recommend the device to be back/dark in colour."

Officer 9 (New user male)

"As a new user of Taser and never handled one before, I found this device very easy to operate. I found the 'safety switch/selector' took some time for me to get used to, however I think this is just down to the device being new, as towards the end I found it much easier to operate.

I found it accurate and effective when in use.

Easy to perform function checks.

Easy to place into covert mode.

Overall a very good bit of kit."

Officer 10 (new user female)

"As a new taser officer I found the taser easy to use and liked the idea of single cartridges being fired as I found it accurate.

I found the display screen at the back of the taser easy to understand.

I liked the colour coded system when it came to magazines [sic] and cartridges as it made it safer for live and training scenarios."

Officer 11 (new user female)

“As a non taser user it's difficult to compare to the other tasers. However, the accuracy fills me with confidence + the amount of chances to hit targets is definetly [sic] a positive”

Officer 12 (T7 user male)

"Good not having to change to difference types of cartridges.

Too many noises that are unnecessary when device operated.

Pistol grip small for people with large hands

Good improved range & punch of darts."

Officer 13 (T7 user male)

“The selector switch has too many functions. Magazine colours Cleary identify their function however cartridges may be easily mistaken. Pistol grip is too small making retention in the event of a struggle nigh on impossible. In addition, trigger position is too far back requiring hand adjustment after arming in order to have comfortable and confident trigger pull. Inconsistent (?) sights from point of aim with both laser and no laser. Warning display not easy to activate under stress as requires distinctive thiking due to being a selector switch. Also activate by accident if too positive a press on selector.”

Officer 14 (T7 user female)

“Great bit of kit. The max distance and effective shots is impressive. Operationally good that you are less likely to reload due to having 10 cartridges. I did find the Taser 10 heavy compared to T7 which was a negative. I feel the light/arc display is no longer a real deterrant compared to the visual electricity/sound on the T7. Great that you now have more control over where your second probe hits, the chance of it being effecitve is now far greater. Great bit of kit!!”

Officer 15 (T7 user male)

“I feel the Taser 10 is more accurate with the 2 aims giving better precision for both/all shots. I really found the trigger easier to use. The cartridges/magazines were more fiddly to load. The sound was a lot quieter which I felt was better for public perception, but did not give me confidence as a user of a suspect's compliance.”

Officer 16 (T7 user male)

"Q17 - The ARC warning/light display is pretty much pointless and would be better if the sound mimicks the ARC sound of T7.

Q13 - (Retention of the device) The magazine easily detaches when/if someone wants to take hold of the T10 from the front.

Q3 - Accuracy seriously diminshes at increased distance so would make it difficult to hit a moving target at distance."

Officer 17 (T7 user male)

"Device is quiet in terms of no visible noise when firing which I did not like. I think for public perception it is silent.

I don't feel other than using the device it was operationally trested. Felt scenarios were not consistent with a live situation - would not have your back to a threat.

I did like that there were multiple shots compared to previous devices.

I would like to have seen videos of it in use so can see it go through clothing to see capabilities of weapon.

I prefer a button than being reliant on a switch."

Officer 18 (T7 user male)

“Having used all taser products during my service I feel that overall it has some good features but feels somewhat gimmicky. Unlike the previous tasers, the impact of the ARC I don't feel will be impactive enough. Having used the AC WARNING ON Live incidents this has deescalated situations quickly. I dont feel like the T10 WARNING would be sufficient. The accuracy of the device is Hit and miss (especally [sic] if I have to hit the skin). I do like the trigger switch but the extend and Reenergise could do with some work. I found it difficult with my thumb to push it up.”

Officer 19 (T7 user male)

“Good accuracy compared to T7 however it still could be improved. The safety switch seems slightly in a different place compared to T7, T7 better. The ark [sic] warning is terible, needs improving. In one scenario, I forgot it needs two shots in different body part so double tapped to CBM” [centre body mass]

Officer 20 (X2 user female)

"I struggled to move the selector switch upwards to extend/re-energise the cycle. The shape of the switch presented me with resistance so I had to alter my grip on the device to achieve the outcome.

I did not like the lack of noise during an ARC display. A flashing torch and a toy-like noise I feel would not be effective. It is not showing the capabilities of the device should it be fired. Knowing that there are potentially 10 shots to fire may encourage more shots than normal as you know you there are more left"

Officer 21 (X2 user male)

“I really enjoyed using the Taser 10 and on accuracy + the single shot feature especially I find it an improvement on the X2. However the 'arc warning' feature with the flashing light wasn't intimindating and I'd be concerned that firing multiple shots would draw unfair critism fom [sic] the public and SLT/PSD.” [senior leadership team/professional standards department]

Officer 22 (X2 user male)

"The T10 give more options to take multiple shots compared to only 2 shots from X2/T7. When doing accuracy shooting was surprised how unaccurate it could be as

the laser would only be zero'd to 1 barrel and at greater distance (?) scope for missing greater.

the arc display is poor and against a violent subject would not working [sic].

the lack of spark has a lack of confidence of due to T10 working. The safety (?) (/) motor skills uder pressure can be hard to manipulate."

Officer 23 (new user male)

“Having never used a Taser Device before this trial, I wasn't sure what to expect but I have really enjoyed being able to familarise myself with using a Taser. I feel the Taser 10 is a good quality Taser which will allow to keep officers safe whilst patrolling the streets. This device was suitable to be handled and was easy to perform a function check and re-energise. I feel that the training I have been fortunate to undertake is of great experience and the trainers have really assisted with this being a really good experience of trialling the Taser 10. Thank you.”

Officer 24 (new user male)

“I found the safety mechanism/lever difficult to operate with my dominant hand thumb and had to compensate with my off hand. But I did not feel like this hindered my operation of the device. In the scenario-based exercises, I found it easy to place 2 shot with a good spread/distance between them in a short period of time while being in a small space.”

Officer 25 (new user male)

“I feel the Taser 10 is a good piece of equipment. However, I feel that in a close situation it could be ineffecitce without a dry [sic] stun option.”

Officer 26 (new user female)

"This device was easy to use for someone who hasn't handled one before. The extended/recharge function was confusing at first as I didn't know how long to hold for or whether to flick it up once.

The accuracy was good with the laser but I struggled in stealth. This was maybe becasue of my lack of experience.

Taser was easy to handle but handle/grip was quite wide for someone with small hands. Overall easy to use + I would feel confident with this device."

Officer 27 (new user female)

“As a non-user I have felt I have been on-par with my fellow colleagues who are Taser users when it came to target accuracy and operational use. However, having being in the presence of other taser (T7) deployment, I do find the sound and visuals of other taser more effective.”

Taser X2

Officer 1 (X2 user male STO)

“X2 is not good at close range, nor is it as accurate as Taser 10.

I would feel safer carrying Taser 10.”

Officer 2 (X2 user female STO)

“X2 - warning display/arc button easier than all on one button on T10.

X2 - harder to reload/load - prefer T10 loading/unloading.

- Red laser I prefer on X2 to T10

- Stealth mode easier and remains in stealth after initial shot.

- Noise warnings/arc noise more impactive on X2 than nose [sic] on T10.”

Officer 3 (X2 user female STO)

"I found the arc warning display more impactive on X2 and it is alot [sic] easier to use the re-energise button.

Using the X2 it was more difficult to get correct probe placement when objects were used as barriers and this would be even more difficult in confined spaces."

Officer 4 (X2 user male STO)

"Whilst the Taser 10 has some limitations, mostly involving the operation of safety switch, I believe that the multiple single shots and increased distance far outweighs the benefits of the X2.

The ability to select barb placement, makes using the X10 [sic] far more accurate and, in my opinion, would make it far more effective operational weapon.

I would be quite confident to exchange the X2 for the X10 [sic] for my day-to-day operational use."

Officer 5 (X2 user male trainer)

“T10 far easier to use due to ability of range and individual slot placement.”

Officer 6 (X2 user male ARV)

“The T10 was impressive and has its place, especially on ARV & specialist roles due to its ability to be used in close proximity. I am however concerned about teething issues (double tabs [sic] etc.) and I find the pistol grip harder to positively draw from the holster

Having used X26, X2 & T10 I think I would prefer to remain with X2 with the option of T10 for special deployments (rifle which is covert etc.).”

Officer 7 (X2 user male STO)

“Overall the T10 is FAR better than the X2 due to the option to place probes to the users choosing. Also allows the police to remain at a safer distance and allow for a greater possibility of a safer conclusion.

X2 PROS - ARC option is very good and effective

- Sounds better”

Officer 20 (X2 user female STO)

“X2 - I find this device comfortable to hold in my hand and easy to operate without having to look at the device to operate.

The sound the device makes when conducting an ARC warning and when fired provides me with an extra level of confidence that it has operated successfully.”

Officer 21 (X2 user male STO)

“The X2 struggles at both long and very short range due to the double shot feature which is dependant on distance to achieve NMI. Other than those issues I believe it to be a competant [sic] device suitable for use in my role.”

Officer 22 (X2 user male surveillance)

"Overall the X2 is a good device albeit needs to feel more robust. The stealth mode should be made easier to ? without having to switch the safety on and activating the lasers before by able to activate.

Should havee [sic] a covert smaller one."

Taser 7

Officer 8 (T7 user male CTSFO)

"The T10's built quality is far superior than the X2. With the T10 you no longer have to cant [sic] the taser to achieve horizontal shot placement.

T7 - I have little confidence in the accuracy due to the make up of the trigger mechanism. During its deployment, at times you can feel it snatch.

I have operationally carried the Axon X26, X2 & T7 - Having trialed the T10, my personal opinion is that its a big step forward. I would recommend the T10 to be rolled out in replacement of previous and current generations

I do not agree with the two types of cartride [sic] (SO & CQ).

Its a variable that I feel places Police Officers at an additional risk."

Officer 12 (T7 user male ARV/CPO)

“The pistol grip on the T7 is quite small in relation to my hand size. This is a concern when in a struggle with an offender. The accuracy of the probes at times when fired don’t seem consistent with the lasers. The cartridges are sometimes difficult to change between during a high stress situation/under pressure.”

Officer 13 (T7 user male surveillance)

“The pistol grip is slightly larger (?) T7 and fits better in the hand, however the trigger feels further back towards the grip and so required hand position adjustment once I had armed the device then wanted to pull the trigger. This promoted unneccessery [sic] movement f the device and additional aiming.

The selector switch has a positive feeling to it however there are too many functions that it does.

There appeared to be much inaccuracy as more shots were fired which then bred questions about where barbs would land.”

Officer 14 (T7 user female surveillance)

“Taser7 [sic]- Positive that you can opt between the two distance cartridges. Weight/size of the taser7 [sic] is role appropriate I feel. The Arc capability of the Taser7 [sic]I believe is a positive, with the visual of electricity. I do not feel the load/unload of the taser7 [sic] operationally is the easiest, however.”

Officer 15 (T7 user male STO)

“I found the T7 single shot better as I could just aim once and was happy that I could obtaine [sic] good probe placement. It saves aiming twice. I like having the option of C/Q and S/O cartridges dependent on the situation I am facing. However I find myself focussing [sic] on the top laser and sometimes disregarding the bottom one. Any movement of my hand on firing often sends the bottom probe off target.”

Officer 16 (T7 user male armed surveillance)

“T7 I feel the T7 is less accurate and seems to jump from where you held the laser dots to where the barbs actually end up, hence my answer the Q3. I would not feel confident in delivering both barbs into a moving subject.”

Officer 17 (T7 user male STO)

“I like that T7 has a loud visible sign and presence and an arc is strong with this device however T10 is more accurate shooting. T10 also saves having to change cartridges which I prefer.”

Officer 18 (T7 user male CTSFO)

“Having used the T7 for over 12 months, my team has used this device twice and on both occasions [sic] it has been in affective [sic]. Having gone through the trial I have seen that the device is not accurate on a target board.

However the arc display is more impactive in my opinion and the use of force will be less than firing multiple shots with the T10 (post incident)

The switch also is very stiff and there's not feedback from the trigger unlike the T10.”

Officer 19 (T7 user male CTSFO)

“T10. Trigger fells [sic] more ""gun"" like which is a massive possitive [sic].

T10. Saftey swich [sic] needs modifiying [sic] as I need to adjust to select fire. T7 swich's [sic] better.

T10 function on saftey swich [sic] is better and easy to use + very accurate for a Taser.

T10 warning v poor its not loud enough I think there needs to be a better warning and a show of force.”

Appendix 2 - Axon training bulletin (1)

AXON

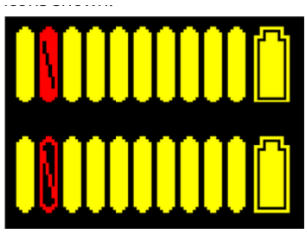
This bulletin is to announce the release of the TASER 10 energy weapon firmware (FW) version 1.3.0. Due to the improvements in this TASER 10 FW release, Axon recommends that agencies update their TASER 10 weapons as soon as possible to receive the new updates.

1) Addressed issue regarding a single trigger pull, two cartridges deployed

Axon received isolated reports of the weapon deploying two cartridges upon one trigger pull. The 1.3.0 firmware introduces a blackout period (100 milliseconds) from the trigger release to the subsequent trigger pull to prevent this issue from occurring.

2) Improvement to live cartridge deployment behavior

- If a live cartridge has a bad connection that prevents it from deploying properly, it will show an error after a trigger pull, and the next cartridge will automatically deploy immediately.
- The central information display (CID) icon will show an error icon as depicted below. The CID displays cartridges 1 through 10 in order along the screen.



- **Troubleshooting guidelines for further investigation in a controlled setting**
  - Step 1: Move the selector switch to the down (SAFE) position.
  - Step 2: Remove the magazine. Determine which cartridge and magazine chamber were related to the error.
    - As shown above, the CID displays cartridges 1 through 10 in order along the screen.
    - The cartridge number from the rear of the magazine view is depicted below.

- 

    - Step 3: Remove all cartridges from the magazine.
    - Step 4: Inspect the interposer bucket (circled in green below) for bending, damage, dirt and/or debris.
    - 
        - If the interposer bucket shows signs of dirt or debris, please use a TASER cleaning kit to clean the pogo pins. This kit can be ordered on the Axon store **HERE** or through your Customer Success Manager and/ or Sales Representative.
        - If the interposer bucket shows signs of bending or damage, please use a TASER interposer bucket repair kit to replace the interposer bucket. This kit can be ordered through your Customer Success Manager and/or Sales Representative.
        - If no dirt, debris, or anomalies are noticed with the interposer bucket, proceed to step 5.
    - Step 5: Install a cartridge into the chamber in the magazine that had the previous cartridge error. Reload the magazine into the energy weapon, confirm that you hear the distinct "click" sound that indicates the magazine is fully seated.
    - Step 6: Move the selector switch to the up (ARMED) position.
        - Observe the CID to read if the cartridge is reading properly upon the device being ARMED.
        - Perform a test deployment on a static target with a cartridge installed in the chamber that previously had the error occur.

- If the new cartridge shows an error or does not deploy, the energy weapon should be sent to Axon for RMA.

3) Addressed issue with sounds (Warning Alert or Connection Alert) extending passed expected timeframe

- Axon received isolated reports of the Warning Alert or Connection Alert sound persisting even after a TASER 10 selector switch was no longer in the tap up position. In some cases, the sound did not stop despite a lost connection. This condition has been improved in firmware 1.3.0.
- In rare occurrences the sound will continue to persist. Axon intends to release a new firmware update to fully resolve this issue by the end of January.

4) Addressed issue regarding the CID going blank upon firing

Axon received isolated reports of the CID going blank. This condition has been fixed in firmware 1.3.0.

5) Addressed issue where cameras were activating during unholster events even when setting disabled.

The TASER 10 weapon was incorrectly transmitting a "Raised while Armed" event at the same time the unholster event occurred. This condition has been fixed in firmware 1.3.0.

6) Addressed issue regarding the weapon firmware version in Evidence.com being incorrect.

Axon received reports that the TASER 10 firmware was being reported as out of date (or showing odd numbers) in the TASER Energy Weapon Dashboard. When a battery pack is inserted into a weapon, the weapon will transmit the firmware version to any dock in the vicinity. The information being uploaded by the TASER docks was incorrect and has been fixed in the 1.3.0 release.

7) Other minor improvements and fixes

For questions, contact Technical Support at 1-800-978-2737 or **support@axon.com**.

Appendix 3 - Axon training bulletin (2)

AXON

On Monday, April 8th, 2024, TASER 10 energy weapon firmware (FW) version 1.4.9, will be released to the field. Due to the improvements in this TASER 10 FW release, Axon recommends that agencies update their TASER 10 energy weapons as soon as possible to receive the new updates.

1) Further improvements addressing the issue of a single trigger pull, multiple cartridges deployed

Axon received isolated reports of the weapon deploying two cartridges upon one trigger pull. Previous firmware 1.3.0 introduced a blackout period (100 milliseconds) from the trigger release to the subsequent trigger pull to prevent this issue from occurring.

Firmware 1.4.9 includes further enhancements to ensure more reliable behavior when the weapon is armed and the loading bars are still showing on the central information display (CID).

2) Addresses issue with multiple trigger pulls only deploying single cartridge

Axon received isolated reports of rapid trigger pulls not firing cartridges, when trigger release and pull are within the blackout period (100 milliseconds). Firmware 1.4.9 includes further improvements to prevent the user from getting ‘stuck’ in the blackout cycle.

3) Sound Improvements

Addresses issue with sounds (Warning Alert or Connection Alert) extending past expected timeframe

Axon received isolated reports of the Warning Alert or Connection Alert continuing after the TASER 10 selector switch was no longer in the tap up position. In some cases, the sound did not stop despite a lost connection. This condition has been fixed in firmware 1.4.9.

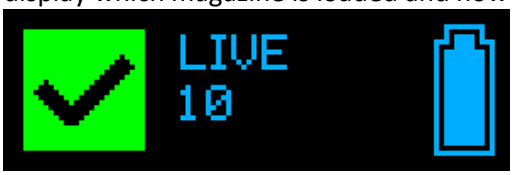
Addresses issue with no Connection Alert but good NMI achieved

Axon received isolated reports of no Connection Alert sound after good NMI was achieved. This condition has been fixed in firmware 1.4.9.

4) Updates to the CID during Function Test Mode

When a function test is initiated, a circle forms on the CID. The icon below displays at the beginning of a function test.

With the new update in firmware 1.4.9, after the selector switch is moved to the up (ARMED) position, the check mark icon indicates the energy weapon passed the function test. Additionally, the CID will now display which magazine is loaded and how many cartridges are detected.



NOTE: The inert magazine has been updated to mock this behavior. However, it will show 10 cartridges in all cases even if 0 cartridges are installed.

5) Reminder on Log Sync Errors (Blinking Blue LEDs on the Dock)

When a battery pack is first inserted into a weapon it will take 5-7 minutes for a firmware update (if needed) and log synchronization to complete. Progress is indicated by the number of bars on the CID. Do not remove the battery pack from the energy weapon or move the selector switch until all nine bars are displayed and the screen goes blank. Removing the battery before the progress bars disappear will cause log sync errors (leading to blinking blue LEDs on the dock).

After the weapon deploys a cartridge, the weapon will go into pre-sleep mode where the CID is blank, but the weapon is not ready to have the battery pack removed. The weapon is ready and waiting for the safety to be rearmed and remember previous cartridge deployment and connections. To immediately end the session, holster the weapon or wait 3 minutes with the safety disarmed. Removing the magazine will also immediately end a session.

Removing the battery while the weapon is still holstered will help prevent log sync errors, by verifying the weapon is not powered and has completed the log sync to the pack for data transfer to the TASER Weapons Dock.

6) Other minor improvements and fixes

For questions, contact Technical Support at 1-800-978-2737 or **support@axon.com**.

Release of Axon Training 2024 Annual Operator Update Presentation

On April 8, 2024, Axon Training will release the 2024 Annual Operator Update for Version 23.

The presentation includes:

- Annual Operator Recertification Requirements
- Law Enforcement Warnings
- Advantages/Readiness
- Tactical Considerations

- Smart Use Considerations
- Medical Overview
- Post Incident

The 2024 Annual Operator Update in-person PowerPoint for Version 23 is located in the **Axon Training Resources**. The in-person PowerPoint contains layering on some of the slides and should only be viewed in slideshow mode. The course can also be completed online via Axon Academy **here**.

TASER energy weapon VR validation resources are now available via **Axon Training Resources**.

Axon Notice to TASER Energy Weapon Instructors:

Axon recommends that any officer or member of public safety certified to use a TASER energy weapon should, in addition to deploying probes into the preferred target area of a subject, train under stress, in a dynamic environment, similar if not equal to a real-life use of force scenario.

Axon Training also recommends Reality-Based Training (RBT) be used during TASER energy weapon training, wherein users are required to make critical decisions under stress, including threat recognition, measurement of response, and selection of the appropriate force option, by evaluating priorities of life.

Axon also recommends that agencies consider incorporating this training into other use of force and critical decision-making training delivered by the agency.

For questions, contact Technical Support at 1-800-978-2737 or **support@axon.com**.

Appendix 4 – UHT 3 Faults by exercise

		Device	C1			C2			C3			C4			C5			C6			C7			C8			C9			C10			C11			C12			C13			C14			C15			C16			C17			C18			C19			C20		
		Attempt	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Exercise	1	Laser	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1
	2	Laser	D1	Nor	Nor	Nor	A6	Nor	Nor	Nor	Nor	Nor	Nor	C4	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	C4	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor
	3	Stealth	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor
	4	Laser	Nor	Nor	C4	Nor	Nor	C4	Nor	Nor	C4	Nor	Nor	C4				Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A1	Nor	Nor	Nor	Nor	A6	Nor	Nor	Nor	Nor	Nor
	5	Laser	Nor	Nor	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	D2	Nor	Nor	Nor	Nor	Nor	Nor	B1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B2	B2	Nor	Nor	Nor	B1	Nor	Nor	A4	Nor	Nor
	2A	Laser	Nor	Nor	C4	Nor	Nor	Nor	Nor	Nor	C4	Nor	Nor	C4	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	D1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B1	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor
	3A	Stealth	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	A4	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor
	2B	Laser	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	D1	Nor	Nor	Nor	Nor	Nor	B2	Nor
	3B	Stealth	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	B2	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor	Nor

A1	Trigger pulled, no discharge	6
A2	Single trigger pull, two probes discharged	0
A3	CID goes blank upon firing, no discharge	0
A4	Probe detaching, no wire visible	2
A5	Battery error during use	0
A6	Wire snapped mid wire	2
A7	Probe jammed in magazine upon firing	0
B1	Cartridge bay errors	4
B2	Warning tones extended past the expected timeframe	11
C1	Wire protruding out from probe body	0
C2	Dart separated from probe body	0
C3	No warning display upon activation	0
C4	CID misreading number of spent/live cartridges	9
C5	No CID	0
D1	CID misreading the number cartridges upon loading	3
D2	unresponsive device upon function checking	1

Fault			
None		499	92.92%
Negligible	E	0	0.00%
Fault (cleared)	D	4	0.74%
Identified	C	9	1.68%
Major	B	15	2.79%
Critical	A	10	1.86%

Appendix 5 - Axon training bulletin (3)

AXON

Bulletin 24.0-1 TASER 10 Energy Weapon Firmware Release 1.5.3

This bulletin is to announce the release of the TASER 10 energy weapon firmware (FW) version 1.5.3. Due to the improvements in this TASER 10 FW release, Axon recommends that agencies update their TASER 10 energy weapons as soon as possible to receive the new updates.

- **Addresses issue with trigger pull, no cartridge deploys**
  - Axon received isolated reports of cartridges failing to deploy when the trigger was pulled. In version 1.5.3, deployments will be prioritized sequentially from bays 10, then 9, and so on down to 1. This improvement will help reduce instances where the weapon does not fire as expected.
- **Addresses issue with cartridge errors on the Central Information Display (CID)**
  - Axon received isolated reports that when the trigger was pulled, the CID showed a red cartridge error. Version 1.5.3 fixes this issue to only display actual cartridge errors.
- **Addresses issue with Connection Alert extending past expected timeframe**
  - Axon received isolated reports that the Connection Alert continued even after the TASER 10 selector switch was no longer in the tap up position. This issue has been fixed in version 1.5.3.
- **Improvements to the progress bars on the CID during a new battery insertion**
  - When a new battery is inserted and the initial log sync is occurring, the progress bars will now periodically blink to indicate activity. Once the the log sync is complete, the progress bars will disappear signaling that the weapon is ready to use.
- **New Icons**
  - **New icon reminder for batteries that have not been docked after 30 days**
    - During function test mode, a red dock icon will now appear if 30 days or more have passed since the last full charge to indicate that the battery should be either docked or swapped for a new one.
    - 

- **New hourglass icon, on the CID, to indicate that a deployment has occurred and the log sync is in progress.**
  - After the weapon is made safe after a deployment, it will enter pre-sleep mode and an hourglass icon will appear on the left side of the CID for three minutes. After three minutes, the hourglass will disappear and the sync bars will progress as normal. The screen will then turn off when the weapon enters sleep mode.
  - 
- **Updates to the CID during Function Test Mode**
  - When a function test is initiated, a circle forms on the CID. The icon below displays at the beginning of a function test.
  - 
  - After the selector switch is moved to the up (ARMED) position, the check mark icon will indicate that the weapon has passed the function test.
    - The CID will now display which magazine is loaded. This is indicated by the color of the cartridges displayed on the CID.
    - The CID will also list the number of cartridges detected in their respective bays, providing a clearer overview of loaded cartridges.
    - Color types:
      - LIVE - Yellow
      - HALT - Blue
      - Training - Purple
      - INERT - Red
      - 
    - ***Note:*** The inert magazine has been updated to mock this behavior. However, it will show 10 cartridges in all cases even if 0 cartridges are installed.
- **Addresses issue with the warning alert strobe operation**

    - Axon received isolated reports of the warning alert strobe operation being reset when transitioning between raised and lower status. This issue has been addressed in version 1.5.3.
- **Addresses issue where the cycle counter could display 6 at the end of the 5-second cycle.**
    - Axon received isolated reports that the cycle counter would incorrectly count up to 6 at the end of the 5-second cycle, even though the weapon only outputs current for 5 seconds per cycle. This has been addressed in version 1.5.3.
- **Improvements to cartridge tracking between deployment sessions**
    - The weapon will track magazine removals and retain knowledge of cartridge status post-deployment. This allows expended cartridges to remain in the magazine and prevents them from being shown on the CID as present.
- **Improvements to the weapon's behavior during arming**
    - Axon received isolated reports of the weapon immediately initiating the warning alert or re-energizing during arming. Version 1.5.3 introduces a delay of 125 milliseconds between arming and the initiation of a warning alert or re-energization.
- **Addresses issue where the energize counter could continue after the magazine was removed during operation.**
    - When the magazine is removed during operation, the energize counter will now end.
- **Improvements to magazine monitoring when the weapon is in sleep mode**
    - The weapon will now monitor if the magazine is removed while in sleep mode. If the magazine is removed, this action will wake up the handle, and constitute a new session.
- **Other minor improvements and fixes**

For questions, contact Technical Support at 1-800-978-2737 or support@axon.com.

List of abbreviations

AFO	authorised firearms officer
APP	authorised professional practice
APP-AP	authorised professional practice – armed policing
APPM	automatic shutdown performance power magazine
ARV	armed response vehicle
CAST	Centre for Applied Science and Technology
CED	conducted energy device
CID	central information display
CQ	close-quarter
CTSFO	counter terrorist specialist firearms officer
CVD	colour vision deficiency
Dstl	Defence Science and Technology Laboratory
FW	firmware
HALT	hook and loop training
LLW	less lethal weapons
MASTS	mobile armed support to surveillance
MOP	measure of performance
NFC	near field communication
NMI	neuro-muscular incapacitation
NPCC	National Police Chiefs Council
OR	operational requirement
POA	point of aim
POI	point of impact
RMA	return merchant authorisation

SACMILL	Scientific Advisory Committee on the Medical Implications of Less-Lethal Weapons
SFIC	surveillance firearms integration course
SFO	specialist firearms officer
SO	stand-off
SR	system requirement
STO	specially trained officer
UHT	User handling trial

List of references

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13. **Conducted energy devices (Taser) | College of Policing**
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Initial distribution

1. T10 project lead
2. Home Office Security, Commissioning Hub
3. National Police Chiefs Council (NPCC) Less Lethal Weapons Administration
4. Home Office Police Powers Unit
5. Defence Science and Technology Laboratory
6. Scientific Advisory Committee on the Medical Implications of Less-Lethal Weapons

Table of amendments

Page number	Amendment	By
28	V0.6 Additional discussion in relation to purple training magazine.	GW
35	V0.6 Amendment to recognise later iterations of probe with single barb.	GW
112	V0.6 Additional content in relation to ‘No warning display upon activation’.	GW
116	V0.6 New section - functionality of HALT system during scenario based training	GW
217	V0.6 New recommendation to Axon in relation to HALT magazine functionality, related to the above (P116)	GW
218	Comment/caveat in relation to firmware 1.5.3	GW
240	Appendix 5, Axon training bulletin in relation to firmware 1.5.3, added.	GW

About the College

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