



## ARMoured TRIALS AND DEVELOPMENT UNIT



### TECHKEWL PHASE CHANGE COOLING VEST

6 – 30 January 2015

**The TECHKEWL Phase Change Cooling Vest (CV) has the potential to be a viable solution to assist the maintenance and well being of soldiers working in hot climates. The system is ergonomically sound from a user perspective. The system's cooling capabilities have not been fully tested and there is a requirement for a hot weather trial. There are concerns over the criteria stated in the Safety Data Sheets and these will require clarification before the CV can be considered for military use.**

ATDU/0405

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**LIST OF ABBREVIATIONS**

ATDU	Armoured Trials and Development Unit
BTA	Bovington Training Area
CV	Cooling Vest
CVR(T)	Combat Vehicle Reconnaissance (Tracked)
HFI	Human Factor Interface
MCC	Mounted Close Combat
PPE	Personal Protective Equipment
PV	Private Venture
SOP	Standard Operating Procedure

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**EXECUTIVE SUMMARY**

**Background.**

1. ATDU approached Techniche International during the Motor Sport to Defence Conference to explore the possibility of trialling their Cooling Vest (CV) as part of a Private Venture (PV). The CV is used in motorsport to keep the driver cool during race conditions. It cools the body using a system of vest/ carrier and cooling inserts/ packs that are worn on the upper torso. This trial was planned with an emphasis on Human Factors Integration whilst conducting tasks wearing Personal Protective Equipment (PPE).
2. ATDU assessed the CV during a variety of user-based scenarios, ranging from in-barracks maintenance, driving and crew tasks in the field, over a 3 week period.

**Aim.**

3. The aim of the trial was to assess the TECHKEWL Phase Change CV for comfort, performance and viability in a military context.

**Results.**

4. The TECHKEWL Phase Change CV integrates well with current PPE and did not cause any discomfort to the user. It did not restrict movement or impede performance whilst carrying out routine maintenance tasks and normal duties. Due to climatic conditions being typical for January in the UK, ATDU was unable to test the cooling capabilities fully and therefore the CV will require further trials in a hotter climate.
5. The cooling packs have material safety issues, and if ruptured, could cause harm to the crew with either contact or fire hazard.

**Recommendations.**

6. ATDU recommends the following:
  - a. Techniche International is required to provide details of the contents of the cooling packs to provide assurance that they do not present a danger to the user if punctured.
  - b. Techniche International is required to establish and clarify the level of exposure required to cause the CV to ignite. These potentially hazardous effects (possibility of ignition) are stated in the safety data sheets provided with the garment.
  - c. The TECHKEWL Phase Changing CV should be trialled in a hot environment to assess its capability at keeping the user's body temperature maintained.
  - d. The TECHKEWL Phase Changing CV can be provided in different colours and military patterns. Should this garment be utilised by the Army it is recommended that a British Military Pattern be made available.

**Conclusion.**

7. The TECHKEWL Phase Change CV has the potential to be a viable solution to assist the maintenance and well-being of soldiers working in hot climates. The system is ergonomically sound from a user perspective. The system's cooling capabilities have not been fully tested and there is a requirement for a hot weather trial. There are concerns over the criteria stated in the Safety Data Sheets and these will require clarification before the CV can be considered for military use.

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**Background**

1. ATDU approached Techniche International during the Motor Sport to Defence Conference to explore the possibility of trialling their Cooling Vest (CV) as part of a Private Venture (PV). The CV is used in motorsport to keep the driver cool during race conditions. It cools the body using a system of vest/ carrier and cooling inserts/ packs that are worn on the upper torso. This trial was planned with an emphasis on Human Factors Integration whilst conducting tasks wearing Personal Protective Equipment (PPE).
2. ATDU assessed the CV during a variety of user-based scenarios, ranging from in-barracks maintenance, driving and crew tasks in the field, over a 3 week period.

**Trial authority**

3. The authority to conduct the trial was granted by ATDU as a PV.

**Aim**

4. The aim of the trial was to assess the TECHKEWL Phase Changing CV in range of differing working conditions whilst gathering user feedback.

**Trial command and resources**

5. The trial resources included:

a. **Trial Personalities.**

Ser	Appt	Personality	Responsibility	Contact
1	Trial Director	Maj Kevin Sloan SO2 CVS ATDU	Supervisor of the Trial Plan and trial execution. Consolidation of the Trial Report.	ATDU-SO2-CVS @mod.uk Tel Mil: 94374 4193 Civ: 01929 404193 Mob: 07971075716
2	Trial Warrant Officer (Trial WO)	WO1 Steven Mansfield RSMI ATDU	Produce the POT. Conduct the trial; collect all data, conclusions and recommendations. Develop Trial Report.	ATDU-RSMI-CVS@mod.uk Tel Mil: 94374 3343 Civ: 01929 403343 Mob: 07976363357
3	Trials Troop Leader(TTL)	SCpl Mark Williams	Provide assistance and user expertise.	ATDU-TpLdr@mod.uk Tel Mil: 94374 2187 Civ: 01929 402187 Mob: 07976358803

- b. **Equipment Requirements.** The following equipment was used during the trial:
  - (1) **TECHKEWL Phase Change Cooling Vest** – Supplied by Techniche International.
- c. **Location.** The CV trial took place at ATDU and BTA.
- d. **Dates.** The trial took place throughout Jan 15.

## Constraints

6. **Environment.** The user trial was conducted in January in the UK, the conditions were typical for the time of year with dry, cold and inclement weather experienced. These conditions meant that the cooling capabilities of the CV were unable to be assessed fully.

## Conduct of the trial

7. **Trial objectives.** The trial objective was to assess the CV's potential employability by a User within the Mounted Close Combat (MCC) community.

a. **Objectives.** The trial objectives were to conduct a subjective User assessment of the CV system, concentrating on the following areas:

- (1) Crew comfort whilst wearing the CV.
- (2) Integration with current PPE.
- (3) Practicality when carrying out routine crew tasks.

8. **Equipment under trial.** The TECHKEWL Phase Changing CV is designed to keep an individual's body temperature cool with a system of vest/ carrier and cooling packs (Fig 1) which is worn under an individual's PPE. The cooling packs (Fig 2) take approximately 2 hours to freeze before use and are subsequently fitted into the carrier/ vest (Fig 3) to enable it to be worn on the upper torso (Fig 4).



Fig 1. Complete system



Fig 2. Cooling pack



Fig 3. Cooling pack being fitted into the carrier



Fig 4. CV being worn

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9. **Method.** The CV was given to Trials Troop who incorporated wearing it whilst going about their daily duties. This included a number of different conditions: working on armoured vehicles, wearing a range of PPE, and driving/ commanding on the Bovington Training Area (BTA). Whilst conducting these tasks they constantly monitored and reported on the CV’s performance for comfort, functionality and cooling effect.

**Summary of results**

10. **Material Safety Data.** There are a number of safety issues with regards to the contents of the cooling pack. These are outlined in Table 1:

Table 1:

Ser	Hazard	Effect	Action	Remarks
01	Acute skin irritation	Redness and irritation of skin	Wash with soapy water	Sensitive skin
02	Acute eye irritation	Redness and irritation of eyes	Flush with water	
03	Ingestion	Unknown	Do not induce vomiting, drink water, get medical assistance.	
04	Fire	Possibility of ignition	Avoid naked flame or spark if the phase changing liquid is absorbed into the vest or other material	

11. **Temperature Control.** The CV was prepared and worn by the user throughout the working day, it remained cool between 6-8 hours depending on the work load and heat of the body. The crew found that the cooling effects of the vest were constant throughout the period and were not overly cold due to the vest configuration. It should be noted that the cooling assessment was in temperate conditions. Once the cooling packs have completely defrosted they should be removed as they create an insulation layer preventing excess body heat from escaping. If the User is not in an environment where he can easily remove the CV, this has the potential to exacerbate overheating.

12. **Crew Comfort/ presentation.** The CV was worn under body armour in a range of clothing options and was found to be comfortable. The CV trialled was blue and although functional did not blend with operational forms of dress (Fig 5).

13. **Integration.** The CV integrated with the current PPE and afforded the crew the same mobility and dexterity as experienced without the CV fitted (Fig 5).



**Fig 5.** CV worn with PPE

14. **Practicality.** The CV did not inhibit the crew from carrying out any of their functions whilst working either in-barracks or when deployed onto the BTA (Fig 6 and 7).



**Fig 6.** Ingress through Comd hatch on CVR(T)



**Fig 7.** In CVR(T) Dvr's compartment

### Recommendations

15. ATDU recommends the following:

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### Conclusion

16. The TECHKEWL Phase Change CV has the potential to be a viable solution to assist the maintenance and well-being of soldiers working in hot climates. The system is ergonomically sound from a user perspective. The systems cooling capabilities have not been fully tested and there is a requirement for a hot weather trial.

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