



**Department of Justice & Regulation
In-Vehicle Tablet Assessment**

P001-2886

(Dated: 19 July 2017)

TCS RURAL PTY LTD

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RE: IN-VEHICLE TABLET ASSESSMENT

OUR REF: 13570 P001-2866

TRANSPORT CERTIFICATION SERVICES

TCS Rural PTY LTD is an operationally independent consultant engineering firm specialised in automotive engineering.

TCS Rural PTY LTD has been approached by Mr John Hartley of the Department of Justice & Regulation (Victoria) to assess the suitability of a tablet that is secured within a Sheriff’s vehicle against the Australian Design Rules, vehicle safety requirements and good engineering practice.

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In-Vehicle Tablet Assessment

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(19/07/2017)



Jarrod Thompson



Phillip Hodges

Introduction

TCS Rural PTY LTD has been approached by Mr John Hartley of the Department of Justice & Regulation (Victoria) to assess the suitability of a tablet that is secured within a Sheriff's vehicle against the Australian Design Rules, vehicle safety requirements and good engineering practice.

TCS Rural's understanding of the operational requirements is outlined below:

- There are various makes and models of vehicles used as Sheriff's vehicles and they are generally four door sedans with a driver's seat and an outboard passenger seat (only) in the front seating row.
- A front seat passenger accompanies the driver at all times.
- Whilst the vehicle is in motion it is necessary for the front seat passenger to use a portable device such as a tablet or laptop and this device is to be secured to the vehicle with a Mounting Bracket Assembly. Throughout this report, any reference to a 'Tablet' also encompasses any other such type of portable device including a laptop.
- The Mounting Bracket Assembly consists of a Primary Bracket, Floor Bracket and Intermediate Bracket.
- The Primary Bracket is purchased from Arkon (further details in Appendix A).
- The Primary Bracket is not mounted in strict accordance with the manufacturer's mounting instructions; instead, it is attached to the floor via a custom made Floor Bracket (rather than being secured directly to the vehicle floor) and it is further secured to the centre console of the vehicle with the Intermediate Bracket.
- Previous engineering and ergonomic assessments have been carried out on the Tablet and Mounting Bracket Assembly and found them to be fit for purpose. It is understood that one recommendation from the previous engineering assessment was to trim the 'Jaws' that form part of the Primary Bracket (and hold the Tablet in place) for aesthetic reasons.
- Following these assessments, one vehicle was involved in a low speed crash and the Tablet become dislodged, prompting concerns that in a high-speed accident the Tablet may act like as missile and cause harm to occupants.

A Toyota Camry was supplied to TCS Rural for assessment. This Subject Vehicle was fitted with a Tablet Mounting Assembly and a Lenovo Laptop. Details and photos of the Subject Vehicle are provided below:

- Make/Model: Toyota Camry 50 SER
- VIN: 6T1BF3FK00X019057
- DOM: 09/2012
- Registration: MCQ944




FIGURES 1-2: FRONT AND SIDE VIEWS OF THE SUBJECT VEHICLE THAT WAS PROVIDED FOR ASSESSMENT


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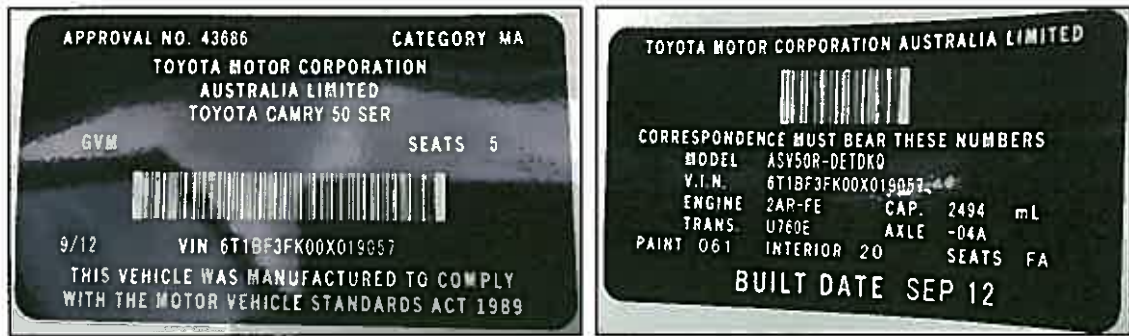
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FIGURES 3-4: IDENTIFICATION PLATE AND MANUFACTURER’S PLATE THAT WERE FITTED TO SUBJECT VEHICLE



FIGURES 5-6: TABLET HELD IN PLACE BY THE MOUNTING BRACKET ASSEMBLY, FIGURE 7: CLOSE UP VIEW OF FLOOR BRACKET (RED ARROW), PRIMARY BRACKET (GREEN ARROW) AND INTERMEDIATE BRACKET (BLUE ARROW)

Prior to being formally engaged for this project, Phillip Hodges of TCS Rural also conducted a brief inspection of a Holden Commodore that was also fitted with a Mounting Bracket Assembly. Details and photos of this Preliminary Vehicle are provided below:

- Make/Model: Holden VF P/CAR
- VIN: 6G1FA5E59GL235557
- DOM: 06/2016
- Registration: MCV128



FIGURES 8-9: PRELIMINARY VEHICLE WITH MOUNTING BRACKET ASSEMBLY INSTALLED

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Qualifications of Consulting Engineers

Jarrold Thompson

- Victorian VASS Signatory C058
- VSCCS Licensed Certifier 130014
- Authorised National Heavy Vehicle Regulator (NHVR) Examiner
- Registered Road Vehicle Certification System Agent
- Member of the Institute of Engineers Australia (MIEAust)
- Bachelor of Engineering (Mechanical)
- Bachelor of Technology (Aerospace)

Phillip Hodges

- Victorian VASS Signatory D001
- VSCCS Licensed Certifier 110003
- Queensland Approved Person MA2239
- Authorised National Heavy Vehicle Regulator (NHVR) Examiner
- Mechanical Engineer
- Qualified Mechanic
- Registered Road Vehicle Certification System Agent
- Justice of the Peace
- Commercial Vehicle Industry Association Australia (CVIAA) President
- Commercial Vehicle Industry Association Victoria (CVIAV) Vice President
- 40+ years of experience in the heavy vehicle industry

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Findings and Observations

TCS Rural's assessment involved a review of Talk Torque Automotive Engineering Report 1011 – 140415-JD, an assessment of the Subject Vehicle against ADR42/04 (Australian Design Rule for General Safety Requirements), investigation into the deployment envelopes of the Subject Vehicle's airbags and road testing of the Subject Vehicle with the Tablet oriented in two different positions. The road testing involved driving the vehicle at speeds of up to 60kph and then heavily applying the brakes and the two different tablet positions are discussed further below.

It was noted that the front seating row of the Subject Vehicle was fitted with driver and passenger front airbags, driver and passenger A-Pillar curtain airbags and driver and passenger seat-mounted airbags (located in the upper outboard sides of the seat backs).

TCS Rural's primary concern is the Tablet interfering with the correct operation of any airbag, and in particular the front passenger airbag. In general, for an airbag to provide maximum protection to the occupant, it should be fully inflated immediately prior to impact with the occupant. Upon impact, it is then designed to rapidly deflate to have a cushioning effect on the occupant and increase the time over which the impulse on the occupant occurs, thereby reducing the force experienced by the occupant. Due to the presence of crumple zones in the front of modern vehicles, and the variation in crumple zone characteristics between vehicles, extensive R&D is required to optimise the front airbag deployment and inflation times for different vehicles. If the front airbags inflate too quickly, they will begin to deflate prior to the contacting the occupant and the cushioning effect will be reduced. Conversely, if the front airbags are still inflating when they make contact with the occupant, they can injure the occupant as they inflate with a very high force. Should the tablet come into contact with the airbags, it may adversely affect the airbag's inflation and therefore reduce the level of protection for the occupant.

To eliminate subjective conclusions on whether or not the Tablet would encroach the deployment envelope of any airbag in the subject vehicle, TCS Rural attempted to obtain details of the deployment envelopes from Toyota, however the attempt was unsuccessful as the information was confidential and could not be provided.

In the absence of evidence from Toyota, an internet search was conducted and the image overleaf in Figure 10 was found which shows the airbags deployed in a vehicle similar to the Subject Vehicle. The large deployment envelope of the front passenger airbag raises concerns that the Tablet, in the location shown in Figures 5 and 6, could interfere with this airbag and reduce the level of protection offered to the front passenger of the vehicle.

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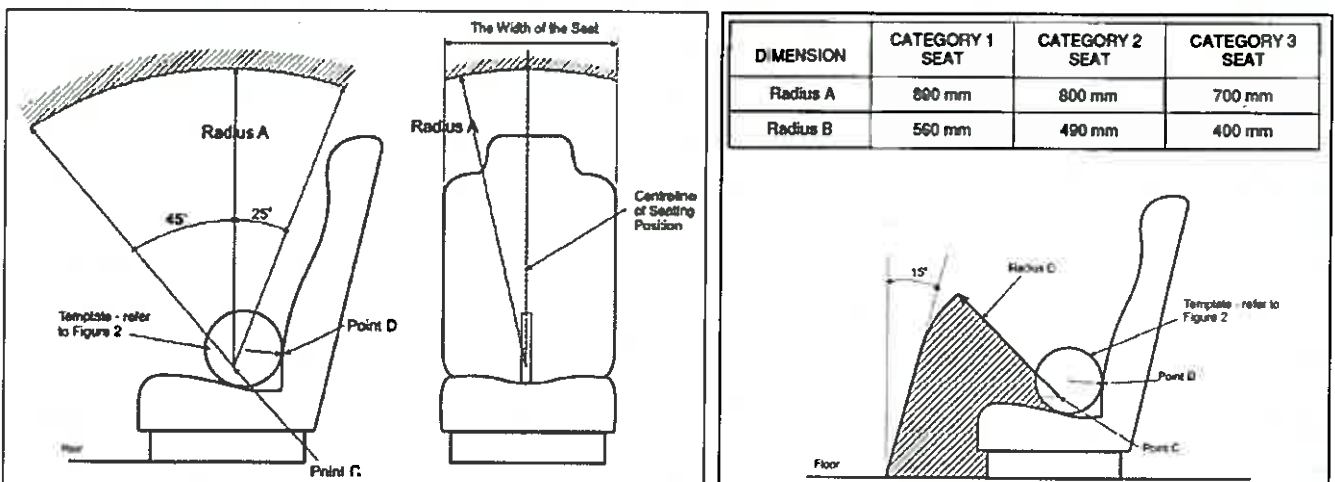




FIGURE 10: AIRBAGS DEPLOYED IN A VEHICLE SIMILAR TO THE SUBJECT VEHICLE

During the assessment of the Subject Vehicle against ADR42/04, Sections 11, 12 and 18, were identified as being relevant.

It is critical that the Tablet does not impede the driver’s view nor create an unnecessary obstruction within the vehicle which could injure occupants. Separate from the affects the Tablet could potentially have on the airbag performance, TCS Rural is of the opinion that the requirements of Sections 11 and 12 are met with the Tablet in the location shown in Figures 5 and 6. This is based on the tablet being located outside of the clear-space requirements shown in Figures 3 and 4 of VSB5 (National Code of Practice for the Manufacture and Installation of Additional Seats), which are provided below as Figures 11 and 12 of this report. VSB5 has been referenced in the absence of any explicit dimensions being supplied in ADR42/04.



FIGURES 11 & 12: CLEAR-SPACE REQUIREMENTS OF VSB5 (CATEGORY 1 DIMENSIONS ARE APPLICABLE IN THIS CASE)

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Section 18 states that any screen which is not a driver's aide must not be visible to the driver. In this case the Tablet is not considered to fall under the definition of a driver's aide and it would most likely provide a distraction to the driver, particularly if updates and/or alerts, etc. were continually popping up on the screen. Therefore, no part of the Tablet screen can be visible to the driver.

Based on the review above, the only Tablet position TCS Rural found which could satisfy the above requirements (and subjectively be as far away from the airbag deployment zones as possible) was one where the tablet was located as low over the centre console as possible, as far rearward as the Mounting Bracket Assembly would allow, adjacent and parallel to the front outboard passenger's right thigh and angled so that it could not be viewed by the driver. However, this alternate orientation is presumed to present ergonomic issues for the outboard passenger and would therefore not be practical on an ongoing basis. This alternate position is shown in Figures 13 and 14 below.



FIGURES 13 & 14: TABLET ORIENTED IN ALTERNATIVE LOCATION

In regard to the tablet becoming a 'missile' under heavy deceleration, TCS Rural conducted some basic road testing where the vehicle's brakes were applied heavily at speeds of up to 60kph. The tablet was oriented in two different positions (the position shown in Figures 5-6 and also the position shown in Figures 13 and 14) and in both positions the tablet was suitably restrained during the deceleration, the Mounting Bracket Assembly held its shape and subjectively, the performance of the system was deemed to be satisfactory and more stable than expected. That said, decelerations experienced in an accident would be greater than those in the tests conducted by TCS Rural so these tests weren't representative of worst case decelerations. It is obviously not possible to test to these worst-case decelerations with standard road testing, and if further testing was deemed to be necessary by the Department of Justice and Regulation, TCS Rural would recommend contacting a company called ASE in South Australia. ASE specialise in seat testing, but may have the necessary testing apparatus to subject the tablet mount to decelerations representative of those experienced during an accident. TCS Rural can provide further information on ASE upon request.

Further to the paragraph above, and in relation to Engineering Report 1011 – 140415-JD, TCS Rural agrees with the calculation of the '20g' force that could be exerted on the occupant by the Tablet during an impact, but disagrees that it would only ever cause minimal harm, particularly if the full force was concentrated over a

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small region of sensitive areas around the head, as would be the case if a corner of the Tablet struck the temple an occupant's head.

Conclusion

The Tablet location shown in Figures 5-6 has the potential to interfere with the safe operation of the front passenger airbag and therefore affect the safety of the front passenger. It was not possible to confirm this interference with absolute certainty as the necessary information regarding the airbag deployment envelopes could not be obtained, but in the absence of this information, it could not be confirmed that the Tablet *didn't* encroach the deployment envelope of the airbags so TCS Rural has taken the precautionary measure of advising against using this orientation.

The Tablet location shown in Figures 13-14 has been deemed to meet the requirements of ADR42/04 and is subjectively less likely to interfere with the front passenger airbag, but it is presumed to be ergonomically unsatisfactory. TCS Rural does not specialise in ergonomic assessments, therefore an expert in ergonomics should be consulted if adoption of this orientation is considered. This consultation should occur prior to implementing this orientation.

The road tests conducted by TCS Rural with the Tablet in both orientations showed the Tablet was suitably restrained by the Mounting Bracket Assembly under the above-mentioned test conditions, however these tests weren't representative of worst-case decelerations and such decelerations couldn't be assessed with standard road testing. The Tablet has the potential to harm an occupant if it were to become dislodged therefore TCS Rural recommends that a company such as ASE is engaged to conduct testing at decelerations greater than that which can be achieved in road testing alone.

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Appendix A – Arkon Installation Instructions

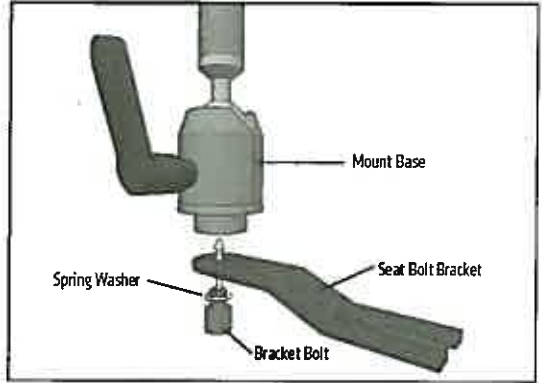
TAB001 | 22" Heavy-Duty Aluminum Seat Rail Floor Mount with Universal Tablet Holder



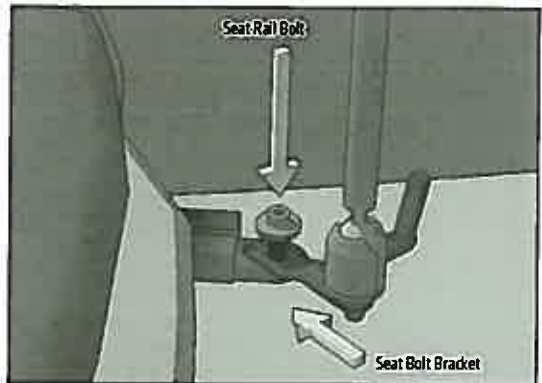
Package Contents:
TAB001 - Universal Tablet Holder
HD001 - 22" Heavy-Duty Aluminum Floor Mount
Includes:
 (3) Seat Bolt Brackets
 (1) Bracket Bolt
 (1) Spring Washer
 (1) Hex key

IMPORTANT: Do not place mount in or near an air bag deployment zone or where it will obstruct view of the road.

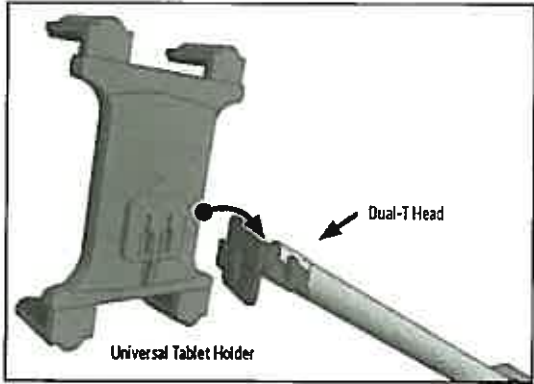
1 Attach the appropriate seat bolt bracket to the mount with the included bracket bolt and hex key. Be sure to position the spring washer between the bolt and bracket as shown.



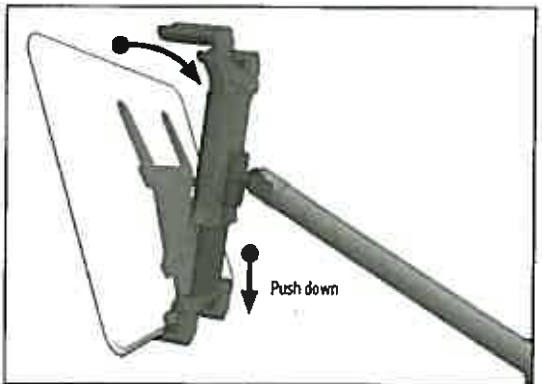
2 With a socket wrench, loosen the passenger seat rail bolt, insert the seat rail bolt bracket, and retighten the seat rail bolt.



3 Attach a holder to the mount by inserting the Dual T-Tabs into the holder and sliding the holder down to lock.



4 Insert tablet into holder by pushing down on the bottom spring-loaded support legs with the tablet. Slide the top of the tablet under the top support legs until it fits snugly in the holder.



IMPORTANT: Install the appropriate size support legs on the holder that will work for your device.

⚠ Safety Precautions
 Do not install Arkon products over an air bag cover or within the air bag deployment zone. Arkon Resources, Inc. assumes no responsibility of liability for injury or death as a result of car crashes and/or air bag deployment.
 Arkon is not responsible for any damages caused to your vehicle, your device, or yourself due to the installation or use of this mount.

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