

PRODUCT DESIGN CASE STUDY

SuperTrunk

Adaptive trunk-flap systems for 7-seat SUVs — from 3D scan to production.

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MARCH 2026

Two vehicles, one problem



01 8939-T1ED7

SHIPPED

2025 Toyota 4Runner 7-Seater

Trunk flaps that run larger than the cargo floor. Resolved through overlay analysis, two test-fit rounds and a die-cut flap cover.



02 9022-T1ED5

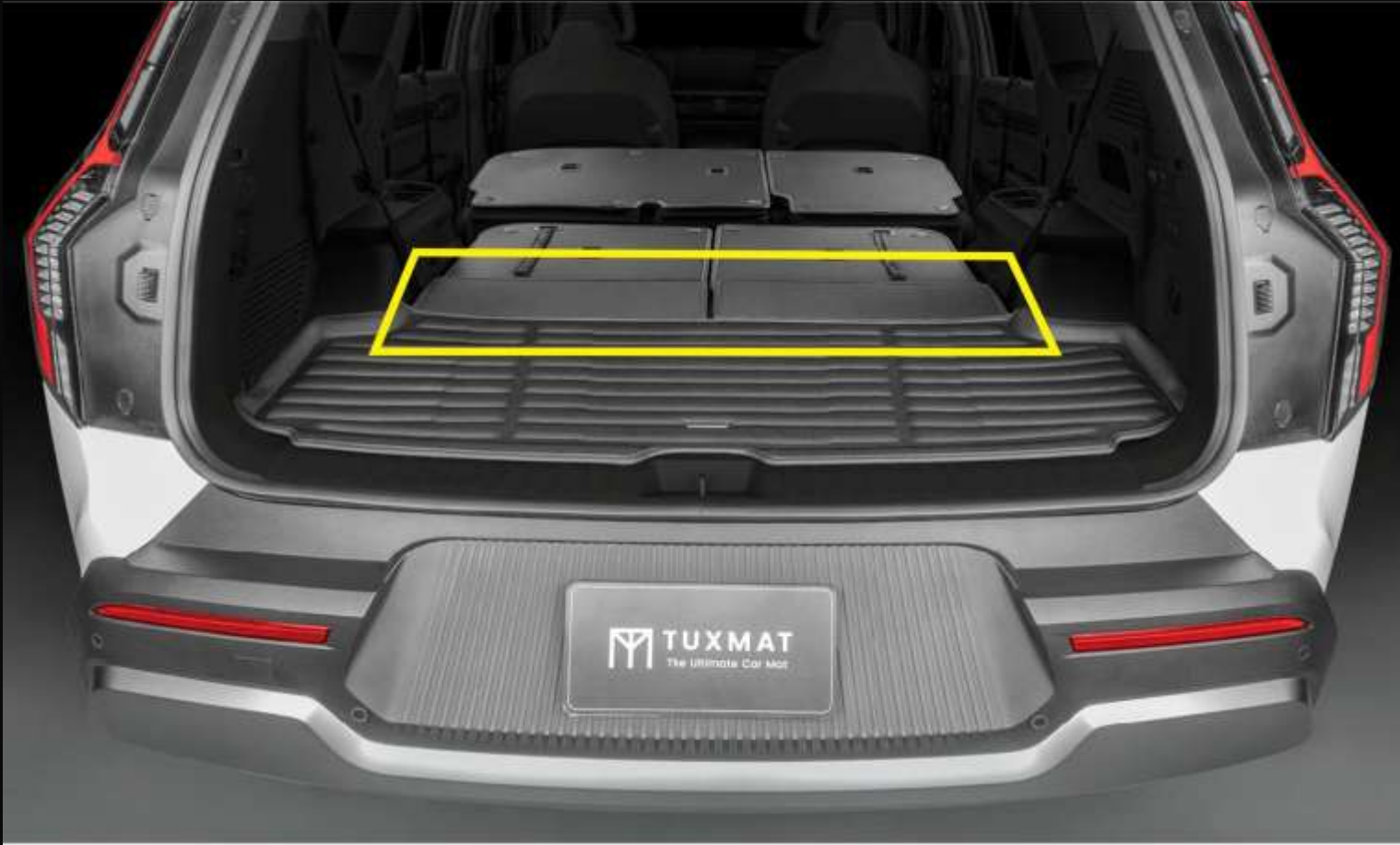
IN PROGRESS

2026 Lucid Gravity 7-Seater

Stowed third-row seats leave carpet exposed. Four concepts explored against seat operation, coverage and end-user clarity.

CONTEXT

What a SuperTrunk is



Cargo floor with the trunk flap deployed over the seat backs.

A die-cut flap sewn onto the trunk mat that is adaptable to seat configuration.



The flap folds with the seat — one part, two states.



PROCESS

Six stages, every product

01

Scan Documentation

3D-scan the vehicle interior and record seat behaviour.

02

Data Analysis

Overlay against the catalogue; measure and note the geometry.

03

Ideation and Proposal

Generate concepts and weigh them against coverage and use.

04

Prep Manufacturing files

Dielines, cut files and bills of material for the factory.

05

Prototype Testing

Test-fit in the vehicle; revise; test again.

06

Product To Production

Release to market.

CASE STUDY 01

2025 Toyota 4Runner 7-Seater

SKU 8939-TIED7

SHIPPED

 TUXMAT®



OBJECTIVE

How can we accommodate coverage for the cargo area with larger trunk-flap transitions comparing to the floor?

CASE STUDY 01 · 8939-T1ED7

Problem identification

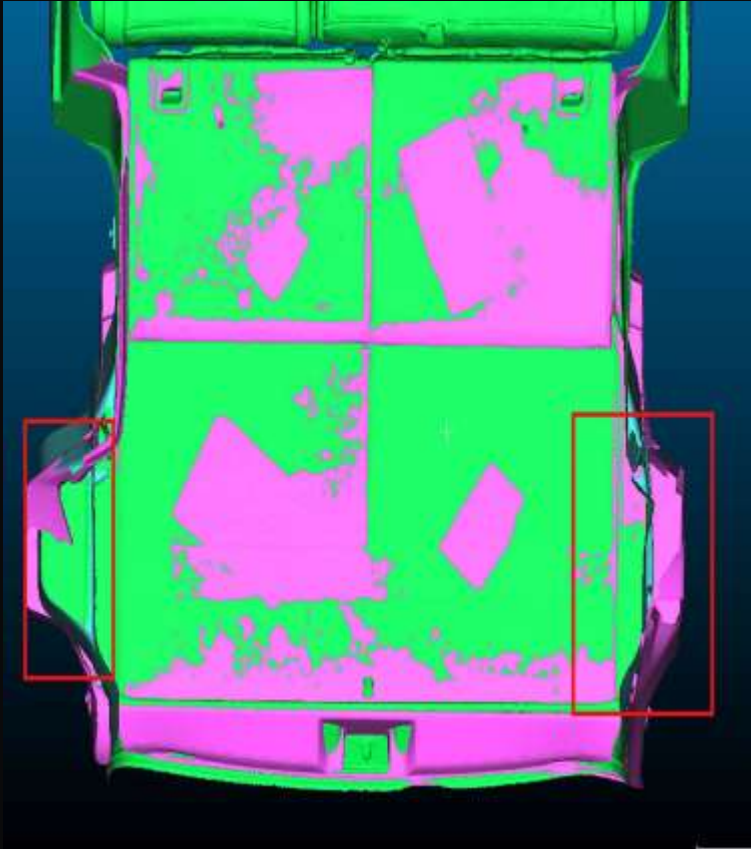


Flap footprint marked against the cargo floor part.

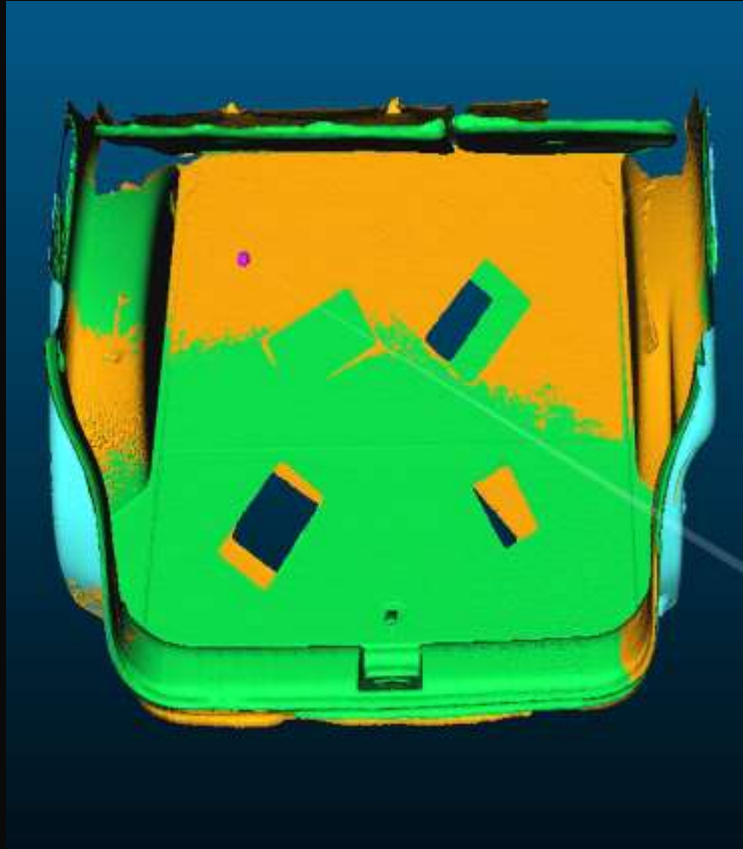
- The trunk flaps run larger than the cargo floor part.
- Seats are power-folding third-row seats.



Overlay data



Scan overlay — catalogue match



Representative photo

WHY WE DO THIS

This is done to see if there are mats in our catalog that fit the same shape. If so, this saves cost in creating a separate mold.

Similar design features

Two platforms, one cargo geometry.

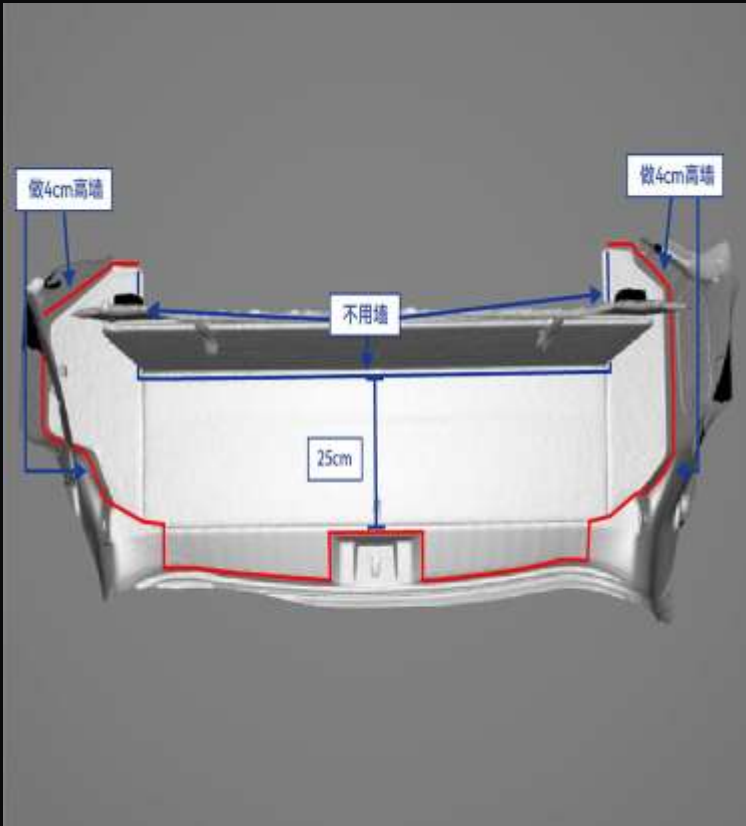


2025 Toyota 4Runner 7-Seater

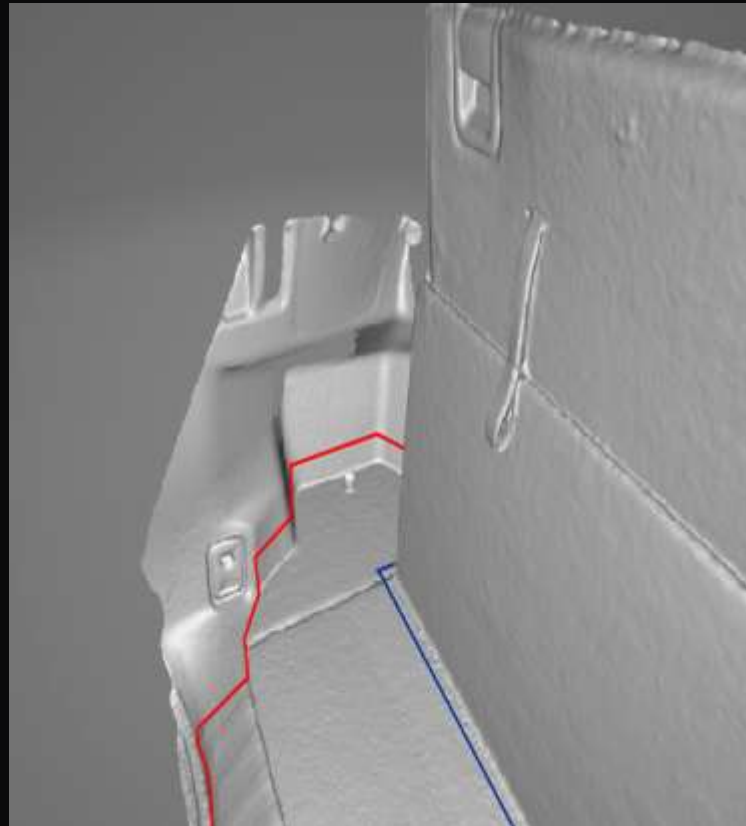


2025 Lexus GX 7-Seater

Scan notes



Section — dimensioned

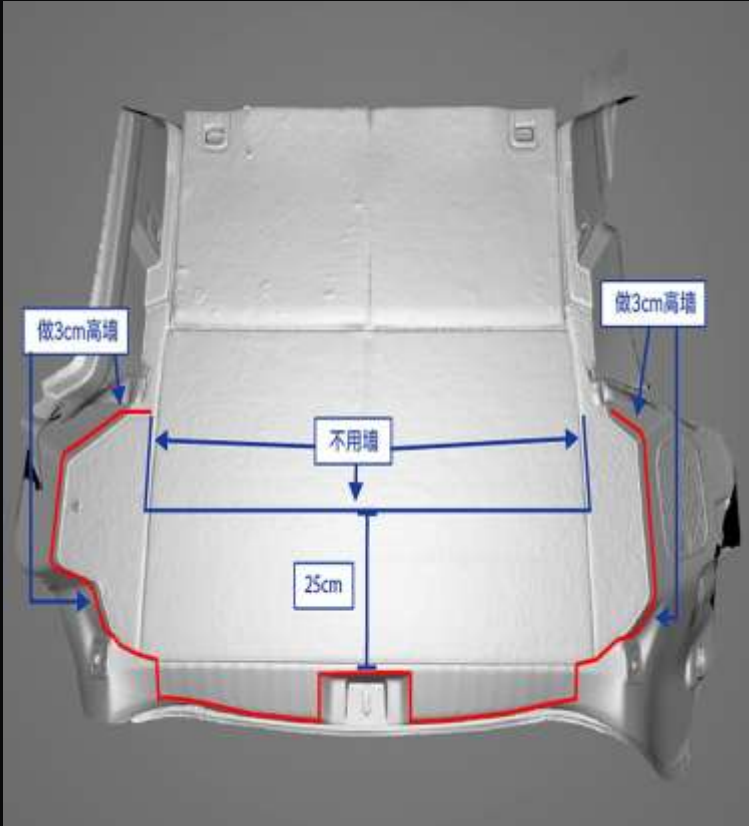


Scan mesh — edge trace

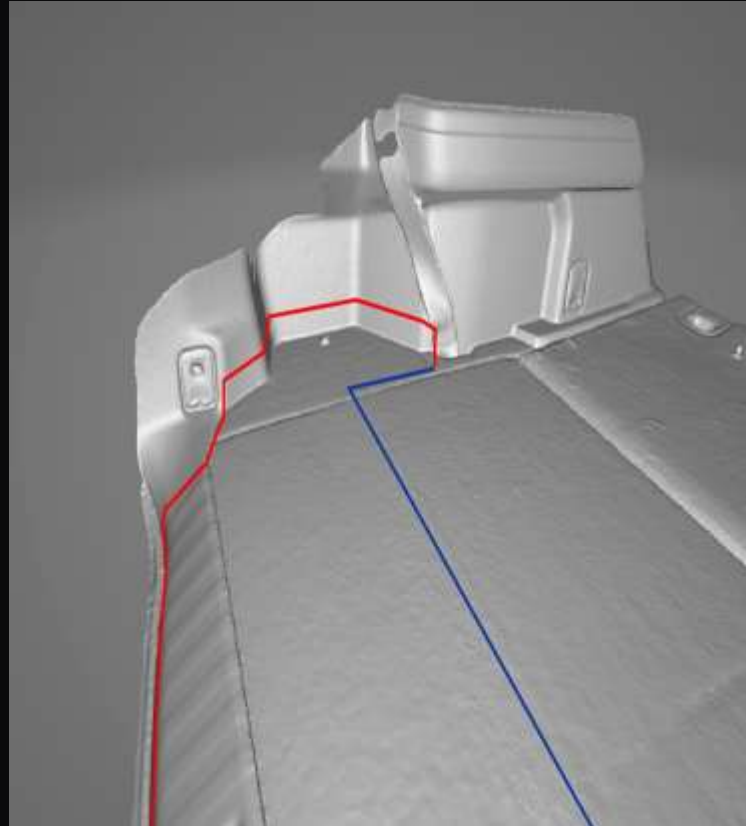
SEATS UP

Measured section through the cargo area with the third row upright. Wall heights and the usable floor span are recorded off the scan mesh.

Scan notes



Section — dimensioned



Scan mesh — edge trace

SEATS DOWN

The same section with the third row folded. The floor extends forward and the transition wall drops away.

Trunk flap variation

Three coverage strategies, marked up on the same vehicle.



01 Regular Trunk Flaps



02 Trunk Flaps with Trunk Flap Covers

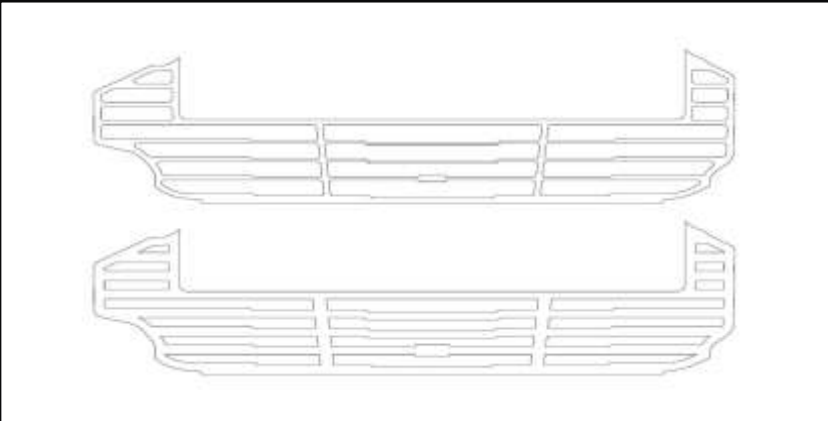


03 Trunk Flap Covers

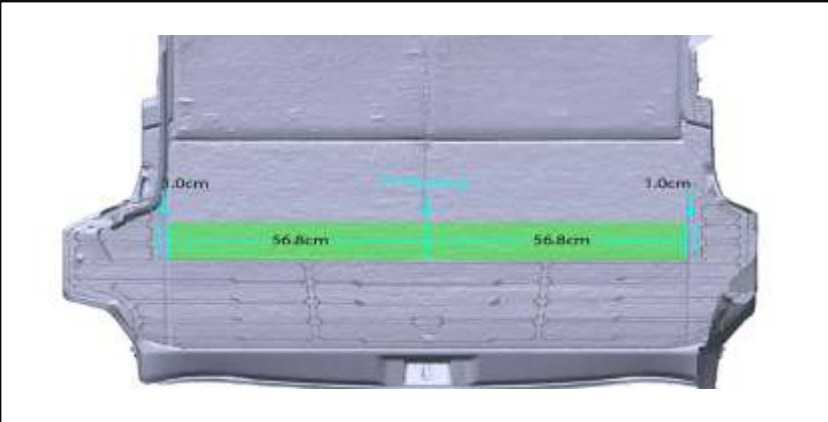
Pattern dieline

HOW EACH PART IS MADE

- Cargo Floor Mat — sent to CNC a top and bottom die that will press PVC heated sheet material
- Trunk Flaps — separately cut on a die-cut machine, then sewn on after
- Seatbacks — cut out on a die-cut machine; bill of materials added to the top of the document



Cargo pattern dieline

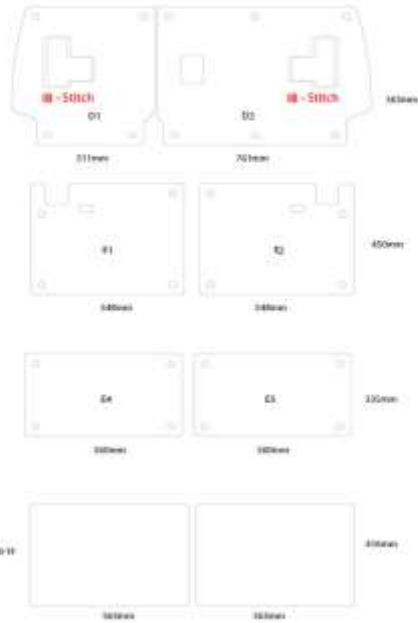


Trunk flap marking

DECISION

Coordinate to have the factory create the die-cut mat coverage for the floor trunk flaps and also the flaps on the cargo mats, to test both concepts.

8939-TED7														04022025	
Part	1	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Part Count	Version 1
SC085120	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
SC085120	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
TXM-GRND	-	3	3	-	3	3	-	3	3	-	3	3	-	24	
TXM-GRND	-	1	1	-	1	1	-	1	1	-	1	1	-	6	



Seatback and trunk flap cut file, with BOM

Test fit v1



DECISION

After test fitting the mats, we decided to proceed with removing the cargo mat trunk flaps and go with the extra cover on the trunk flaps.

Cargo mat, trunk flaps and covers fitted together for the first time.

Test fit v2



Second round with the revised flap covers.



Full coverage, seats folded — no exposed carpet at the transition.

Available to the market



LIVE ON [TUXMAT.COM](https://tuxmat.com)

Full-Coverage Mats for 2025–2026
Toyota 4Runner 7-Seater

TuxMat.ca · 8939-TIED7

CASE STUDY 02

2026 Lucid Gravity 7-Seater

SKU 9022-TIED5

IN PROGRESS

 TUXMAT



OBJECTIVE

How can we accommodate TuxMat coverage for all seating configurations for the 2026 Lucid Gravity 7-Seater model?

CASE STUDY 02 · 9022-TIED5

Problem identification



Third row stowed into the rear lower trunk area.

THE GAP

When the third row seats are stowed away in the rear lower trunk area, there is an area of exposed carpet if a standard SuperTrunk product was created for this vehicle.

Seat configurations

Four states the mat has to survive.



1. Seats Up



2. Seats Down



3. Tucked In Seats (Without Cover)



4. Tucked In Seats (With Cover)

The mat has to read as one product across all four. Configurations 3 and 4 are the ones a standard SuperTrunk cannot cover — they are what the four concepts on the following slides are trying to solve.

Trunk spec — seats stowed

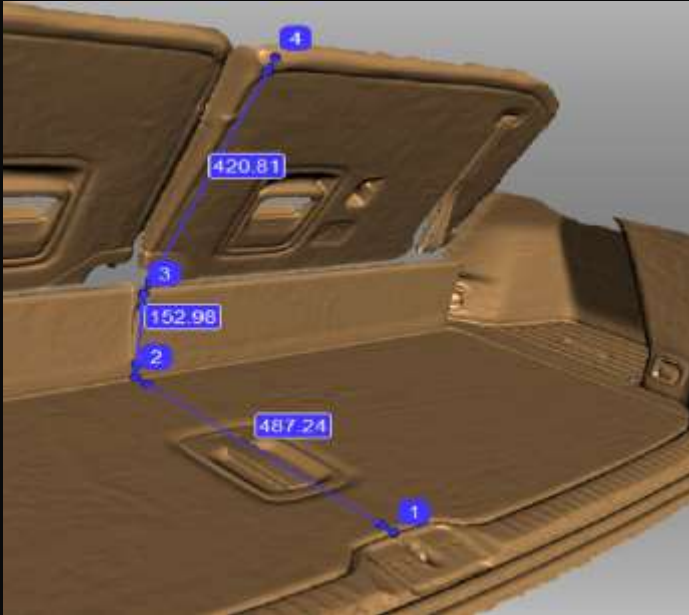


When seats are stowed, they are the same geometry as the 5-seater Gravity trunk.



As measured.

Trunk spec — seats upright



Upright measurements

When seats are upright, the total length of exposed carpet material is shorter.



As measured.

Four possibilities

Assume D will be made — this discussion only applies to TE.

01

Adaptable Trunk Flaps
without E seat backs

T + F + F + F

Full-trunk coverage in both third-row states using large flat flaps.

02

Adaptable Trunk Flap
Hinge
with E Seat backs

T + F + F + E

The same coverage, with seat-back covers added underneath the flaps.

03

Normal TED orientation
+ Flat when Seats
stowed

T + F + E

Standard SuperTrunk, plus one loose piece for the stowed condition.

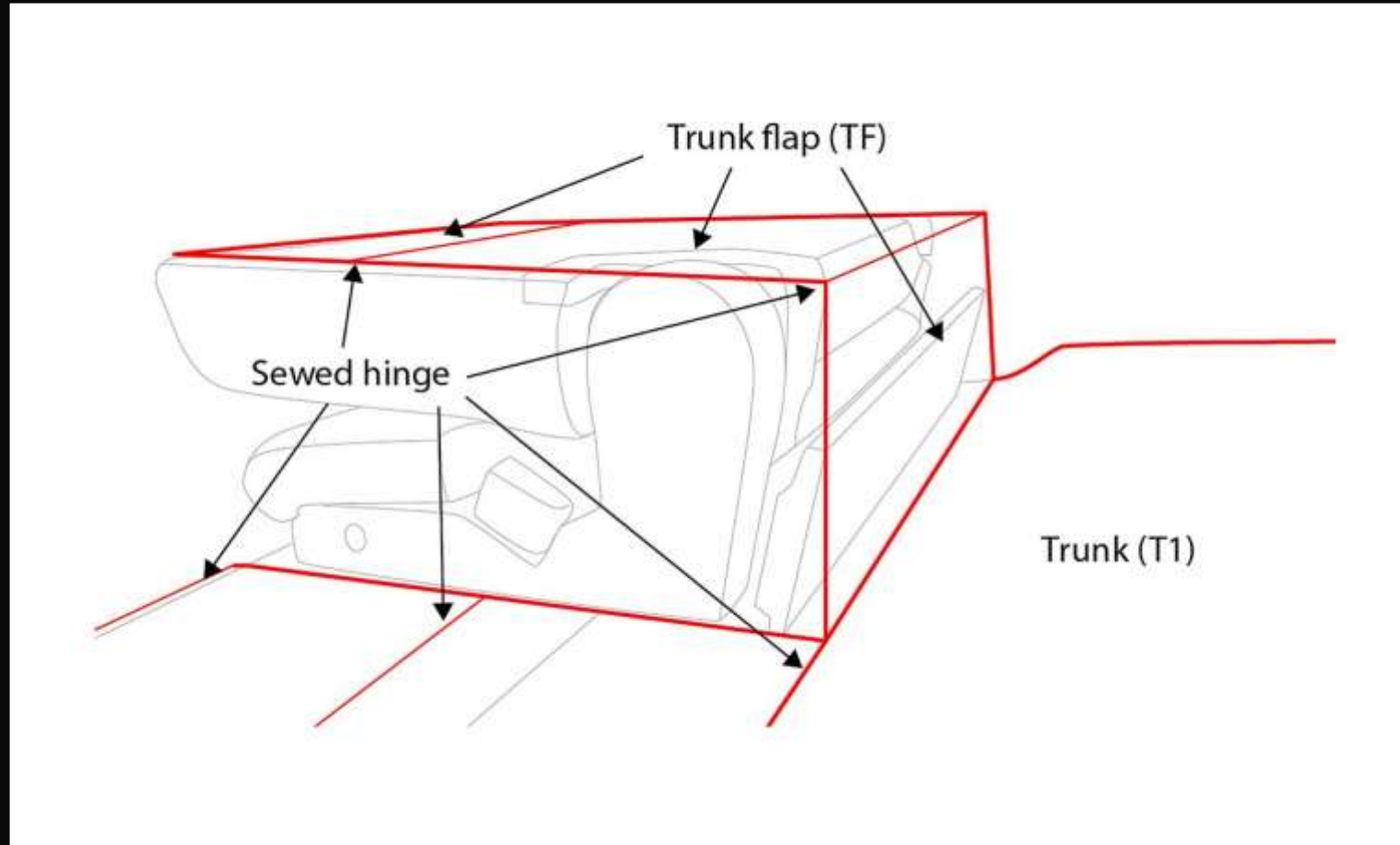
04

Cancel SuperTrunk

NOT BUILT

Ship the 5-seater part with a fitment note, or nothing at all.

Concept 01 — sewn-hinge flaps



Trunk flap (TF) sewn to the trunk panel (T1) on a fabric hinge.

CONCEPT 01

Adaptable Trunk Flaps without E seat backs

T + F + F + F

This concept provides coverage over the full trunk for both variations of seating in the third row.

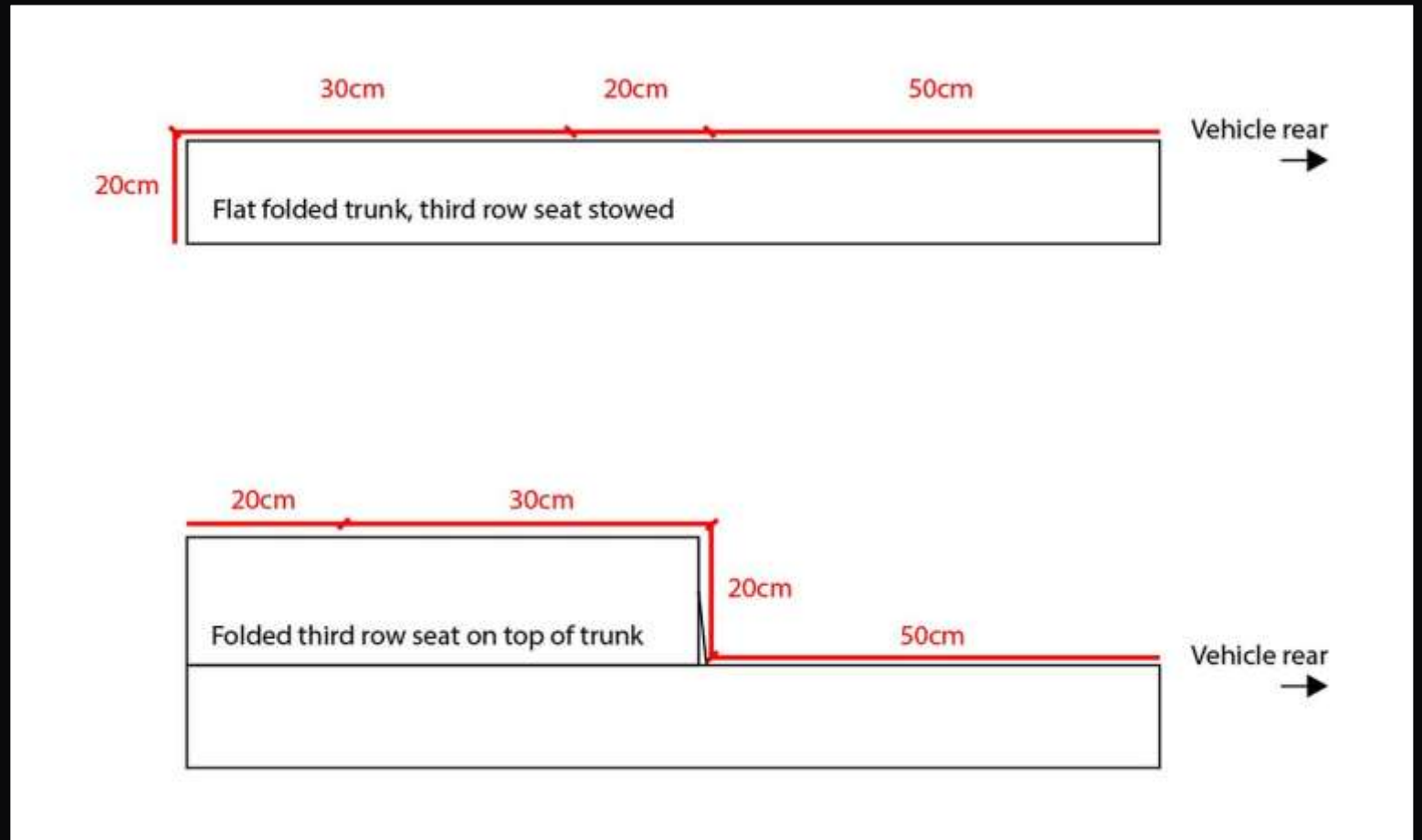
Concept 01 — section, seats stowed

CONCEPT 01

Adaptable Trunk Flaps without E seat backs

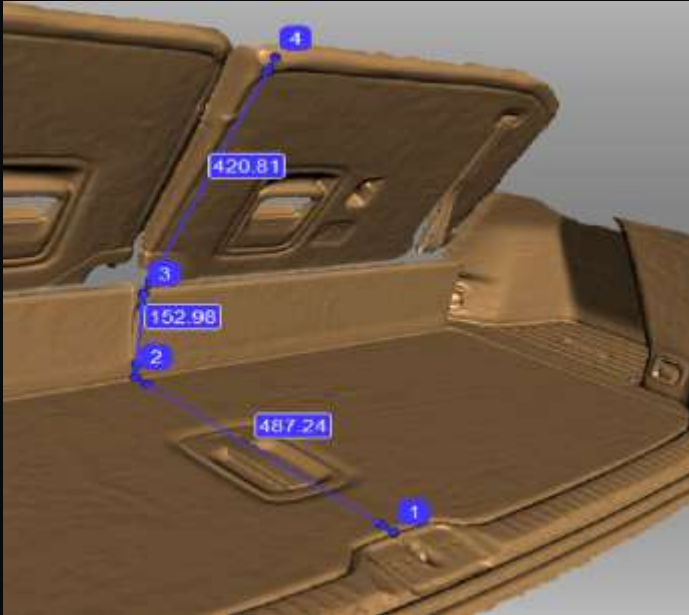
T + F + F + F

- These are all large flat pieces and will not accommodate cutouts on the seat back.
- Actual measurements on prototype will vary based on angle of trunk flap and thickness of material.



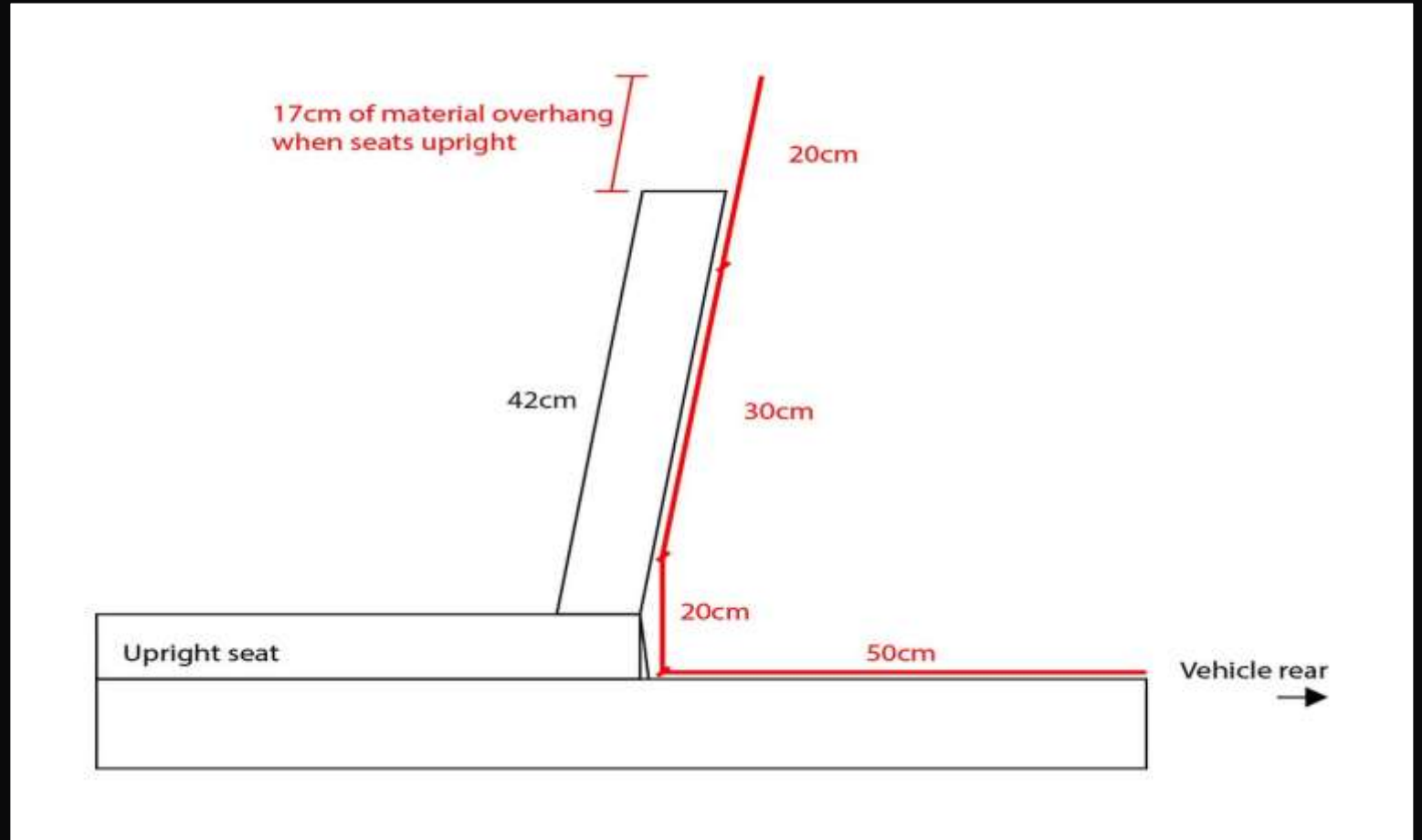
Flat folded trunk with the third-row seat stowed, and folded on top of the trunk.

Concept 01 — seats upright



Upright scan reference

With the seats raised, the flap has nowhere to go — the overhang is the problem this concept has to answer.



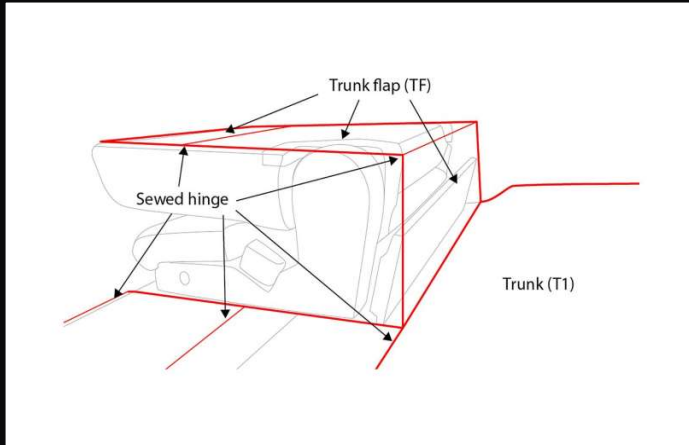
17 cm of material overhangs when the seats are upright.

Concept 01 — scale mockup



Scale mockup — folding behaviour checked by hand before committing to a prototype.

Concept 01 — assessment



CONCEPT 01

Adaptable Trunk Flaps without E seat backs

T + F + F + F

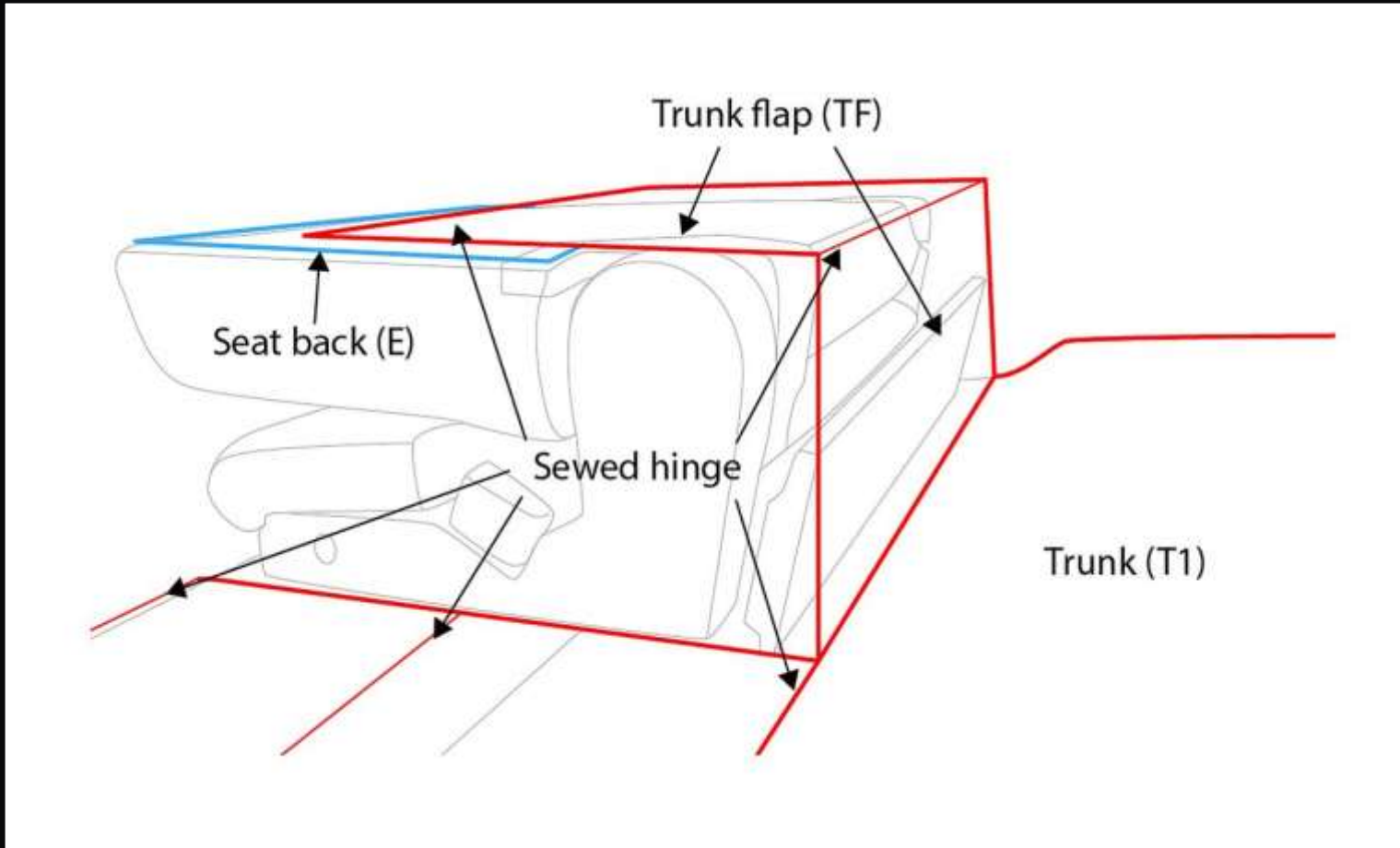
PROS

- Maintains full coverage in all seating scenarios

CONS

- Excess material unable to stay up when seats are upright
- Seat backs exposed when seats are upright
- If flaps need folding to accommodate seat movement, the extra instruction may frustrate end-users
- Maybe weird with seatback latch cut-outs on the trunk flap when the seats are stowed away

Concept 02 — flaps over seat backs



Seat back (E) added under the sewn-hinge flap.

CONCEPT 02

Adaptable Trunk Flap Hinge with E
Seat backs

T + F + F + E

Like the first concept, this concept provides coverage over the full trunk for both variations of seating in the third row.

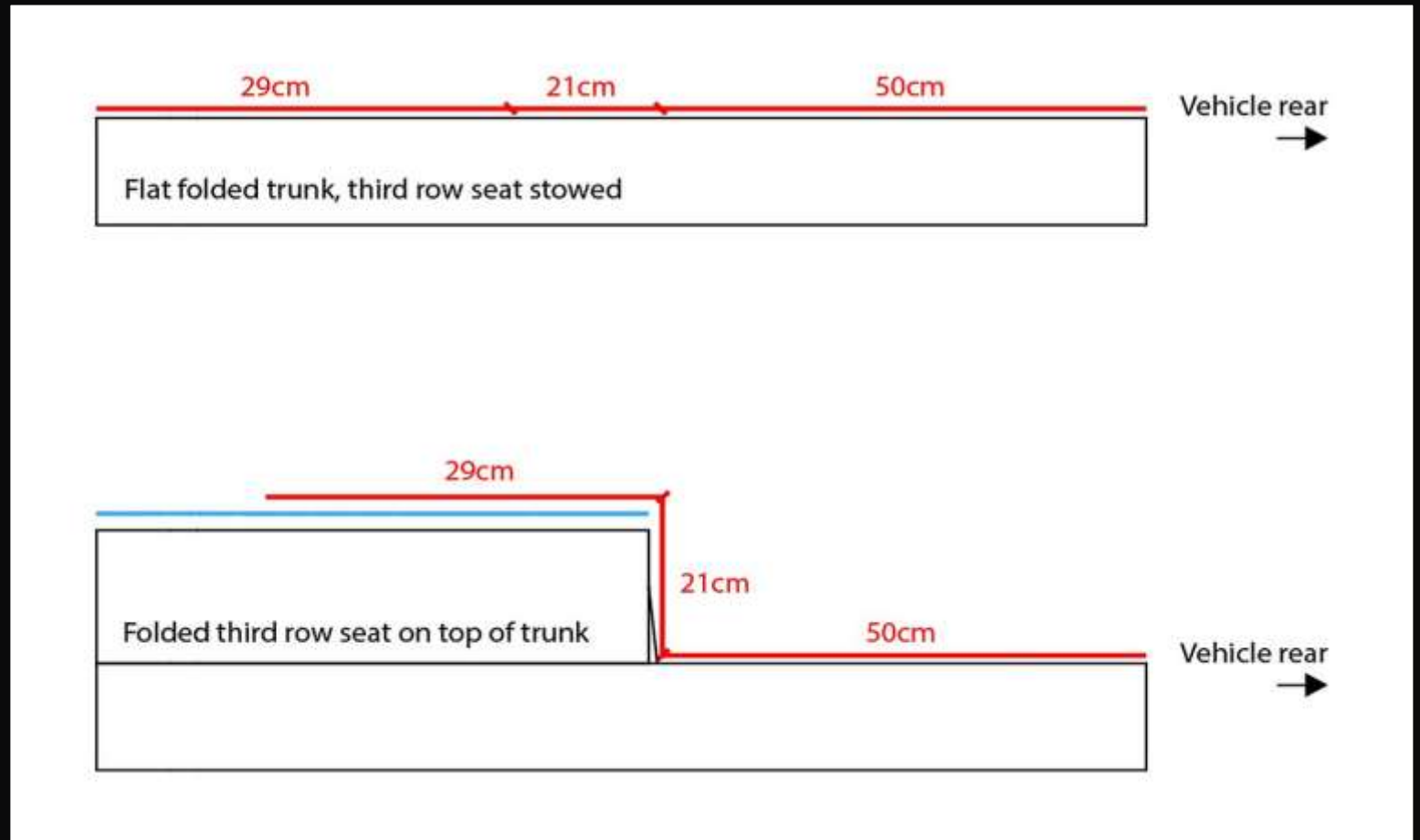
Concept 02 — section, seats stowed

CONCEPT 02

Adaptable Trunk Flap Hinge with E Seat backs

T + F + F + E

The overlap of trunk flaps onto the seat backs may cause some obstruction in the operation of the seats (access to handles etc).



29 cm / 21 cm / 50 cm across the stowed and folded conditions.

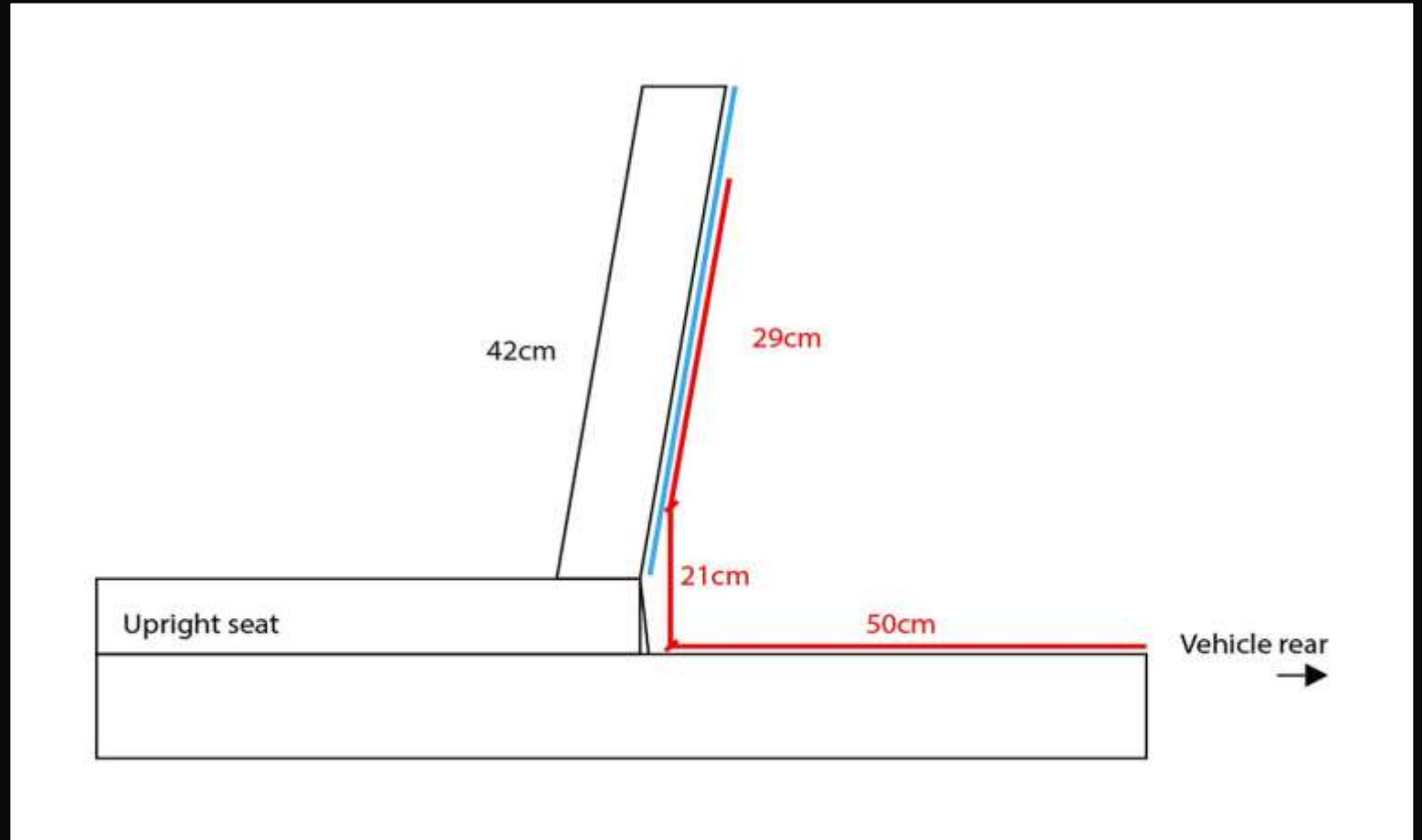
Concept 02 — seat back covers

CONCEPT 02

Adaptable Trunk Flap Hinge with E Seat backs

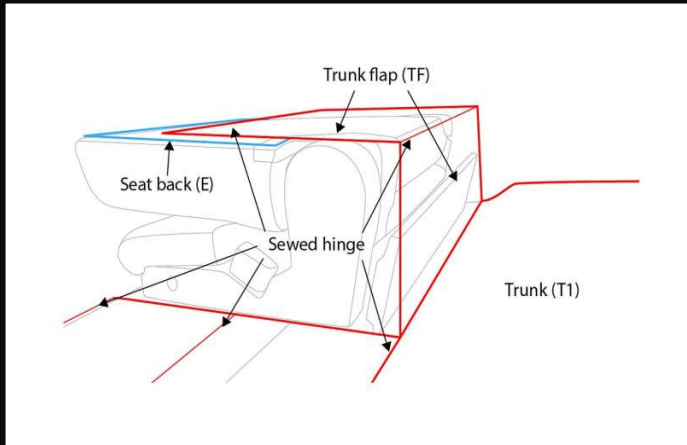
T + F + F + E

The difference is the inclusion of seat back covers that will provide the seat with protection if the large flaps need to be folded away.



Seat back cover retained under the folded flap.

Concept 02 — assessment



CONCEPT 02

Adaptable Trunk Flap Hinge with E Seat backs

T + F + F + E

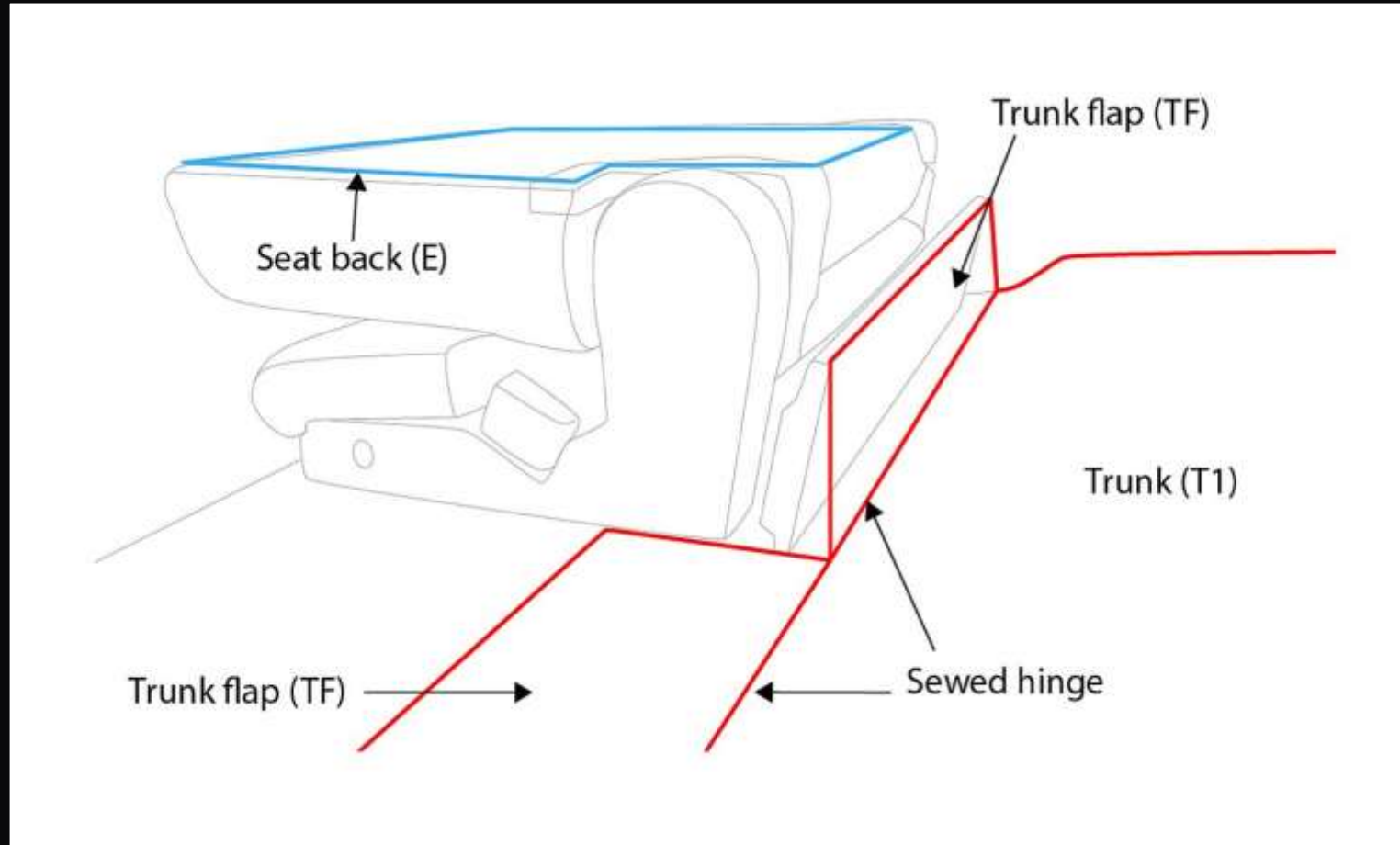
PROS

- Maintains full coverage in all seating scenarios
- Seat backs also are covered when upright

CONS

- The ambiguous overlap of flaps to the seat back may cause confusion and obstruct seat handle access
- If flaps need folding to accommodate seat movement, the extra instruction may frustrate end-users
- Doubling up coverage on the seat backs may also pose confusion for end-users
- How do we keep the flaps from falling over when the seats are upright

Concept 03 — standard TED orientation



CONCEPT 03

Normal TED orientation + Flat when Seats stowed

T + F + E

Looks best when seats are upright, like our other SuperTrunk products.

Standard trunk, flap and seat-back split — our existing product architecture.

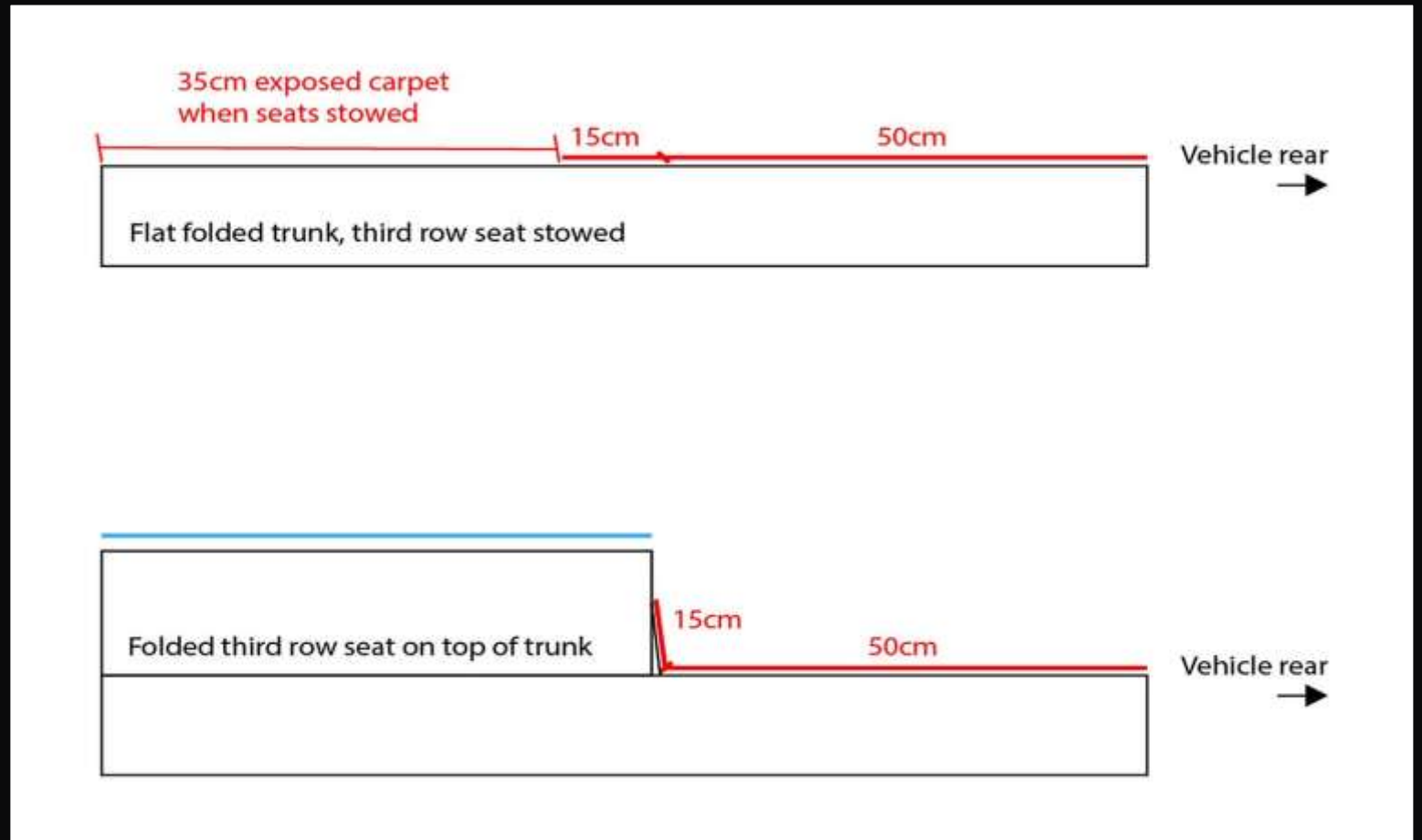
Concept 03 — section, seats stowed

CONCEPT 03

Normal TED orientation + Flat when Seats stowed

T + F + E

- The standard SuperTrunk would function well if the seats were not stowed. Otherwise carpet would be exposed, and the same problem prompting this discussion would not be solved.
- However, an individual piece just to be used in that area when the seats are stowed can still provide protection as a possibility.



35 cm of carpet stays exposed when the seats are stowed.

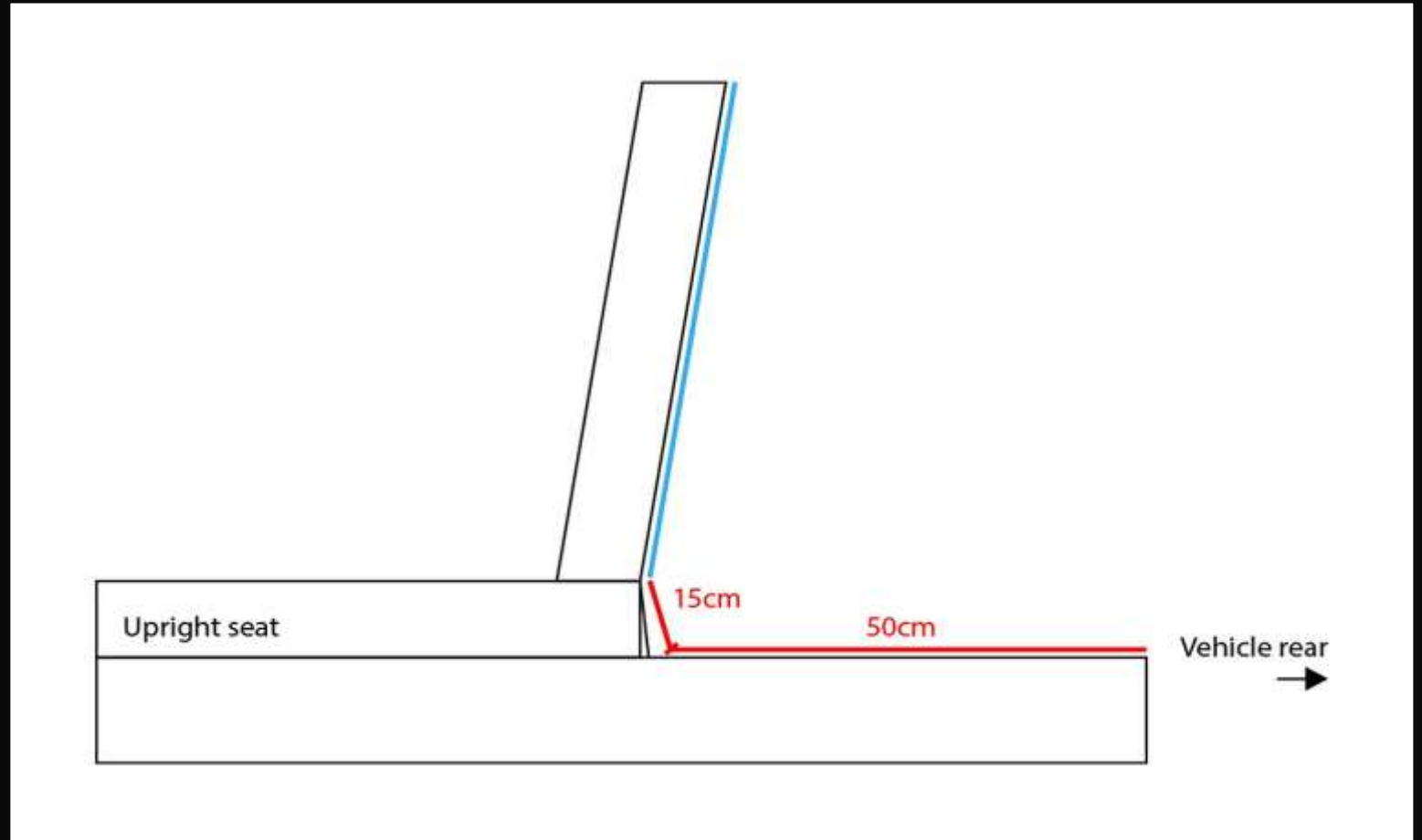
Concept 03 — seats upright

CONCEPT 03

Normal TED orientation + Flat when
Seats stowed

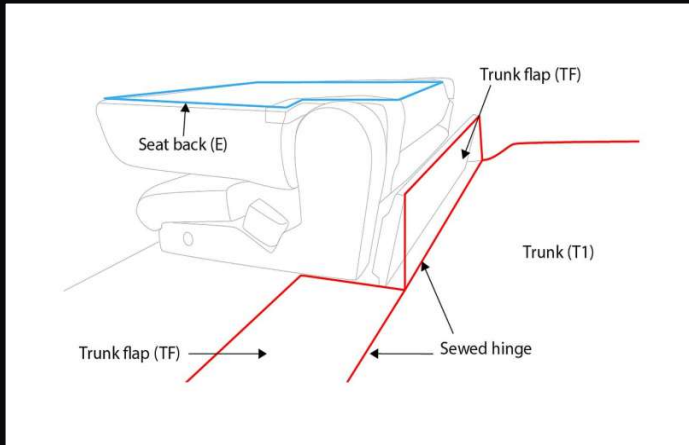
T + F + E

Looks best when seats are upright, like our
other SuperTrunk products.



Upright seat with the standard 15 cm / 50 cm split.

Concept 03 — assessment



CONCEPT 03

Normal TED orientation + Flat when
Seats stowed

T + F + E

PROS

- Smaller pieces matching our product standard would be easier to use for the customer
- Seat backs maintain coverage when upright
- Possible individual piece to cover the area under the seats can be used when seats are stowed

CONS

- Back to original problem of large area exposed where seats are meant to latch onto floor
- An extra piece may cause further confusion for the customer

Concept 04 — cancel SuperTrunk

CONCEPT 04

Cancel SuperTrunk

NOT BUILT

- We can simply not create SuperTrunks for this vehicle.
- Many customers that are knowledgeable about their niche vehicles will often dig deep with research, and some will buy the 5-seater SuperTrunk product for their 7-seater vehicle because they do not intend to use their third-row seats at all.
- The alternative is to make it fully equivalent to the 5-seater SuperTrunk, with a fitment note stating it "Only works when third row seats are stowed".



5-seater geometry — what a stowed Gravity trunk already matches.

WHERE IT STANDS

Next Steps

Flat-pack construction under evaluation

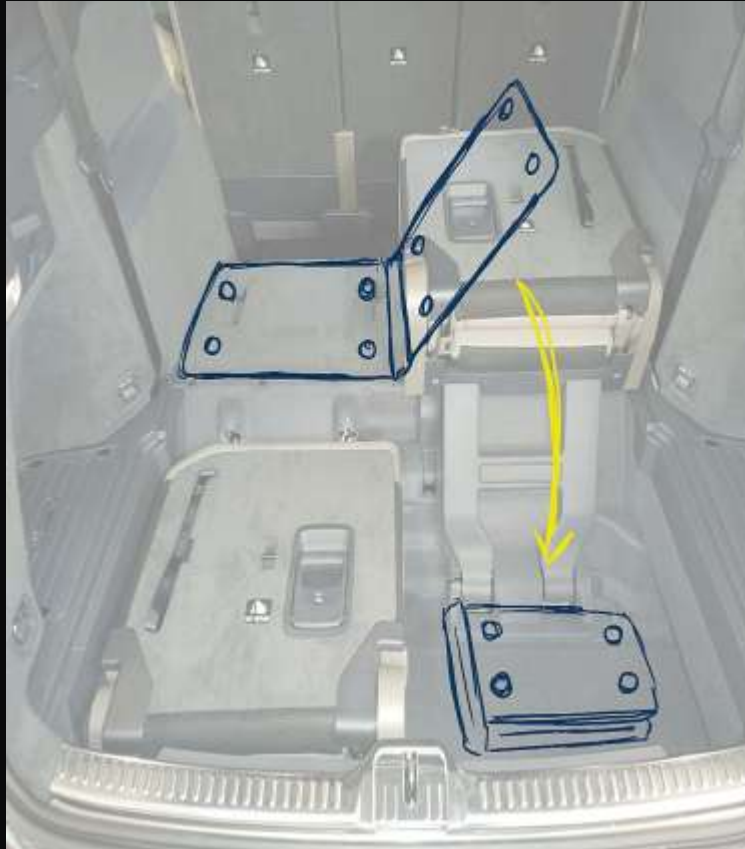
OPEN



Flat pack mat



E1 / E2 seated flat

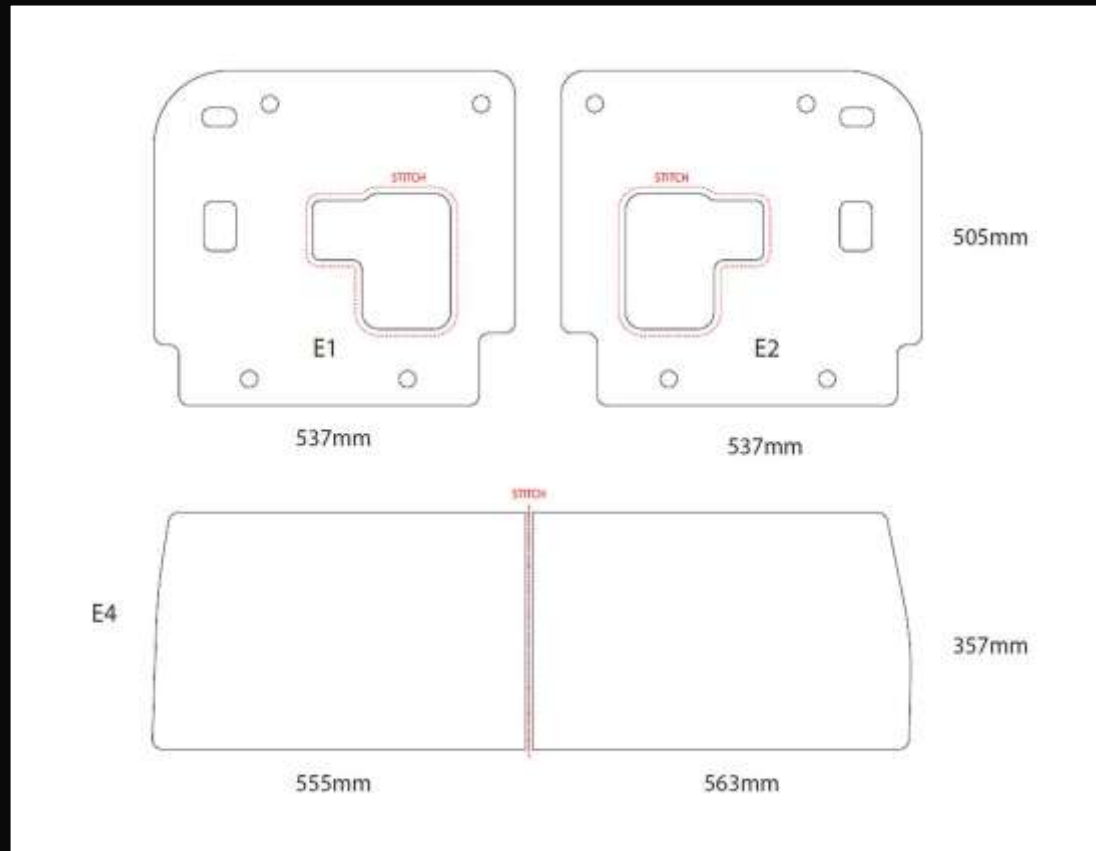


E2 folded up over the stowed seat

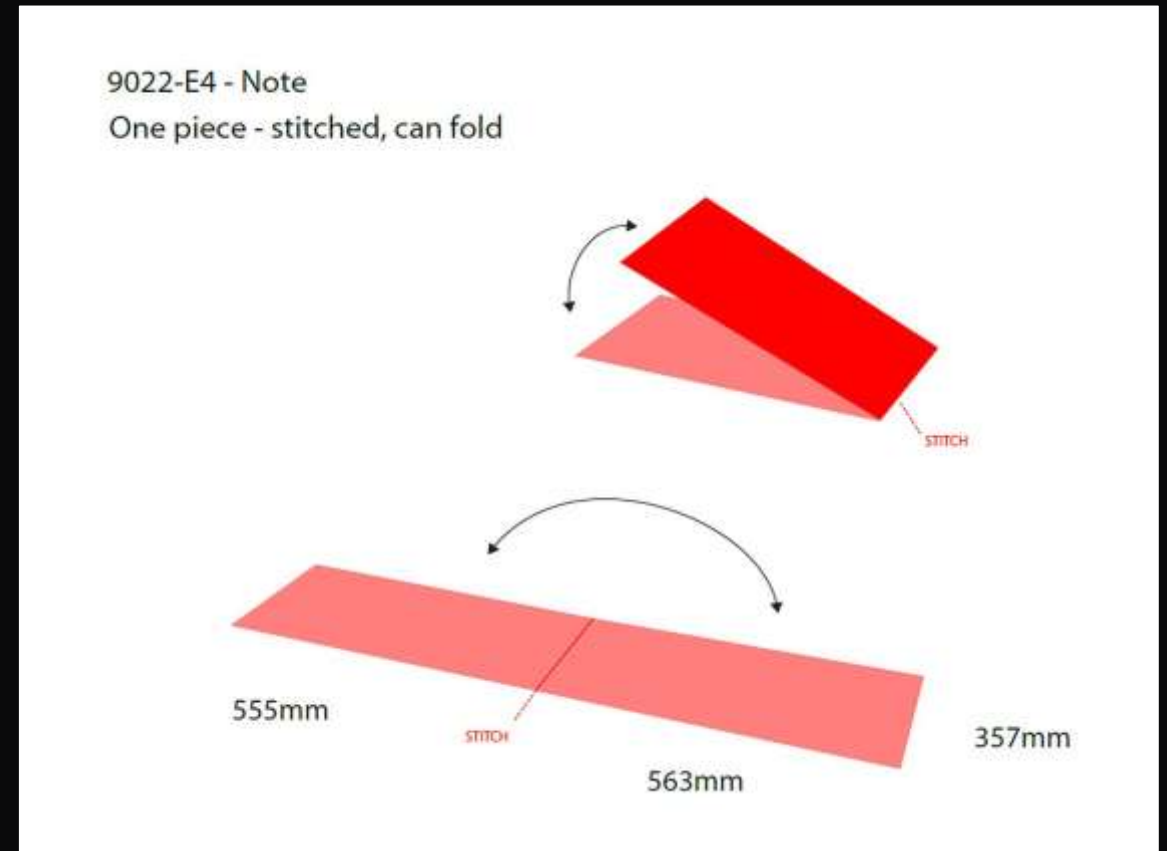
WHY FLAT PACK

One stitched piece that ships flat and folds in the vehicle — coverage in both seat states without a second loose part for the customer to store.

Flat pack mat — dieline



E1, E2 and E4 pattern — 537 mm / 505 mm / 555 mm + 563 mm.



9022-E4 - Note
One piece - stitched, can fold

9022-E4 — one piece, stitched, can fold.

NOTHING OVERLOOKED

Thank you

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