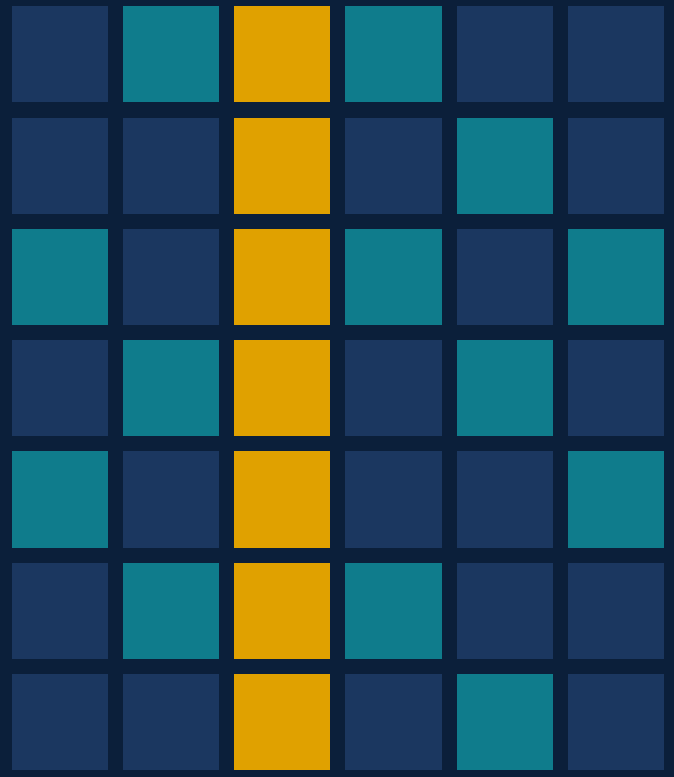
MESAS 2026 · ARTILLERY FIRE SUPPORT AND RECONNAISSANCE

Assessment of Reconnaissance Capabilities in Artillery

A multi-criteria comparison of Czech systems and NATO alternatives



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01 Range is useless without reconnaissance

1

Ground systems

Direct observation, identification, location and battle damage assessment

2

Weapon-locating radars

Point of origin and impact of enemy fire, without line of sight

3

UAV systems

Observation behind terrain and in depth; target confirmation

None of them meets every requirement alone.

TODAY IN THE CZECH ARMY

Ground observation vehicles **LOV-Pz, LOS-M** and the weapon-locating radar **ARTHUR**. How do they compare with NATO alternatives, and what should be modernized first?

02 A repeatable assessment framework

1
Open-source data
data sheets, official and defence sources

2
Criteria
from operational requirements

3
Expert survey
16 of 20 specialists, scale 0–10

4
Weights
scoring · Fuller · Saaty, averaged

5
Ranking
WSM and TOPSIS

6
Agreement & benchmark
ρ, τ, WS · vs. best alternative

4
evaluation groups

21
systems compared

27
criteria in total

2 + 3
ranking methods + agreement measures

Technical comparison only: cost, logistics, training and integration are outside the scope.

03 Four groups, evaluated separately

Vehicle platforms	**LOV-Pz**	**LOS-M**	PIRANHA 5	CV90 MkIV	ASCOD	VBMR Griffon
Sensor suites	**LOV-Pz suite**	**LOS-M suite**	BAA II	Kate-LR	NERIO-ULR	
Weapon-locating radars	**ARTHUR**	ELM-2311 C-MMR	GM200 MM/C	AN/TPQ-53	COBRA	Giraffe 4A
UAV systems	***no organic UAV***	Puma 3 AE	Vector AI	ScanEagle	TEKEVER AR3 EVO	

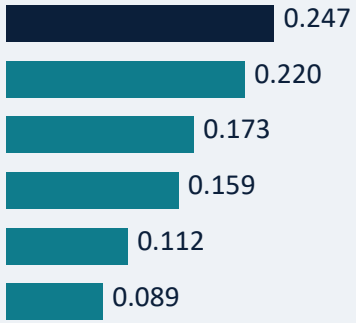
in Czech service

Open sources only · NATO systems · declared performance, not common field tests

04 What the specialists value most

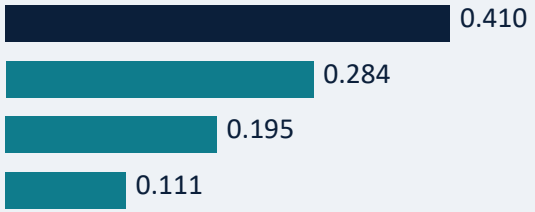
Vehicle platforms

Terrain mobility ≈ 47 %



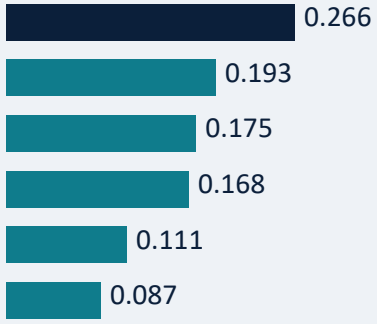
Sensor suites

Recognition dominates



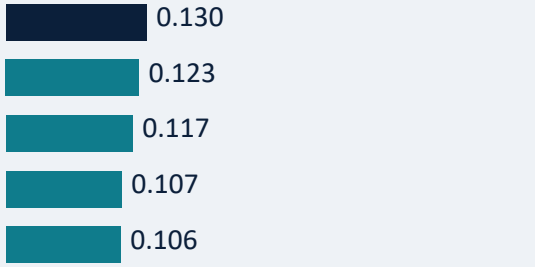
Weapon-locating radars

Preference for multifunction



UAV systems

Sensor criteria = 55.5 %



05 Two ways to aggregate the same data

Weighted sum (WSM)

Adds up weighted, normalized scores.



score = Σ weight × value

Compensatory: one excellent value can make up for weak ones.

TOPSIS

Distance to an ideal and to a worst-case alternative.



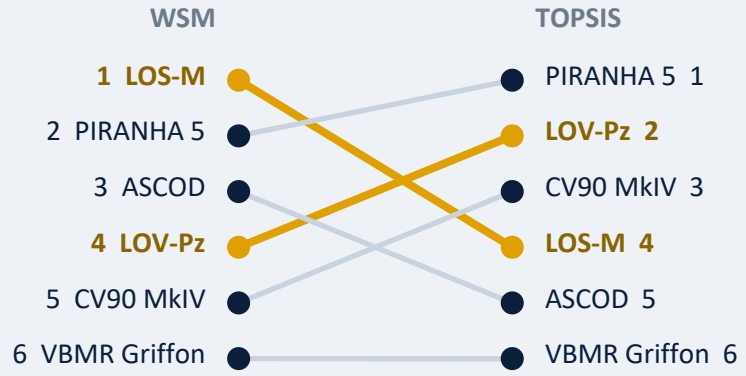
closeness = $d^- / (d^+ + d^-)$

Rewards a balanced profile across all criteria.

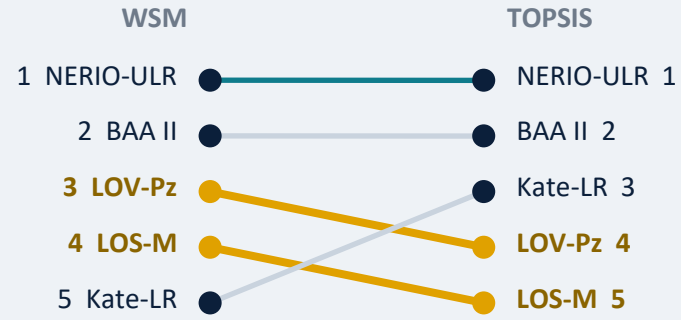
Agreement → robust result. **Disagreement** → uneven profile. We report it, and we measure it.

06 Rankings: WSM versus TOPSIS

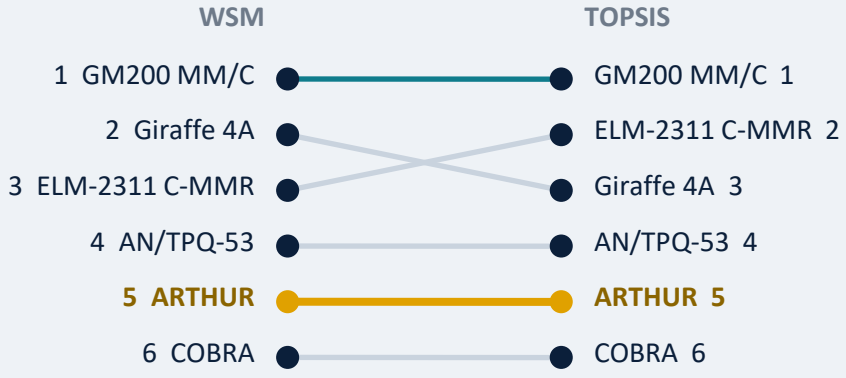
Vehicle platforms



Sensor suites



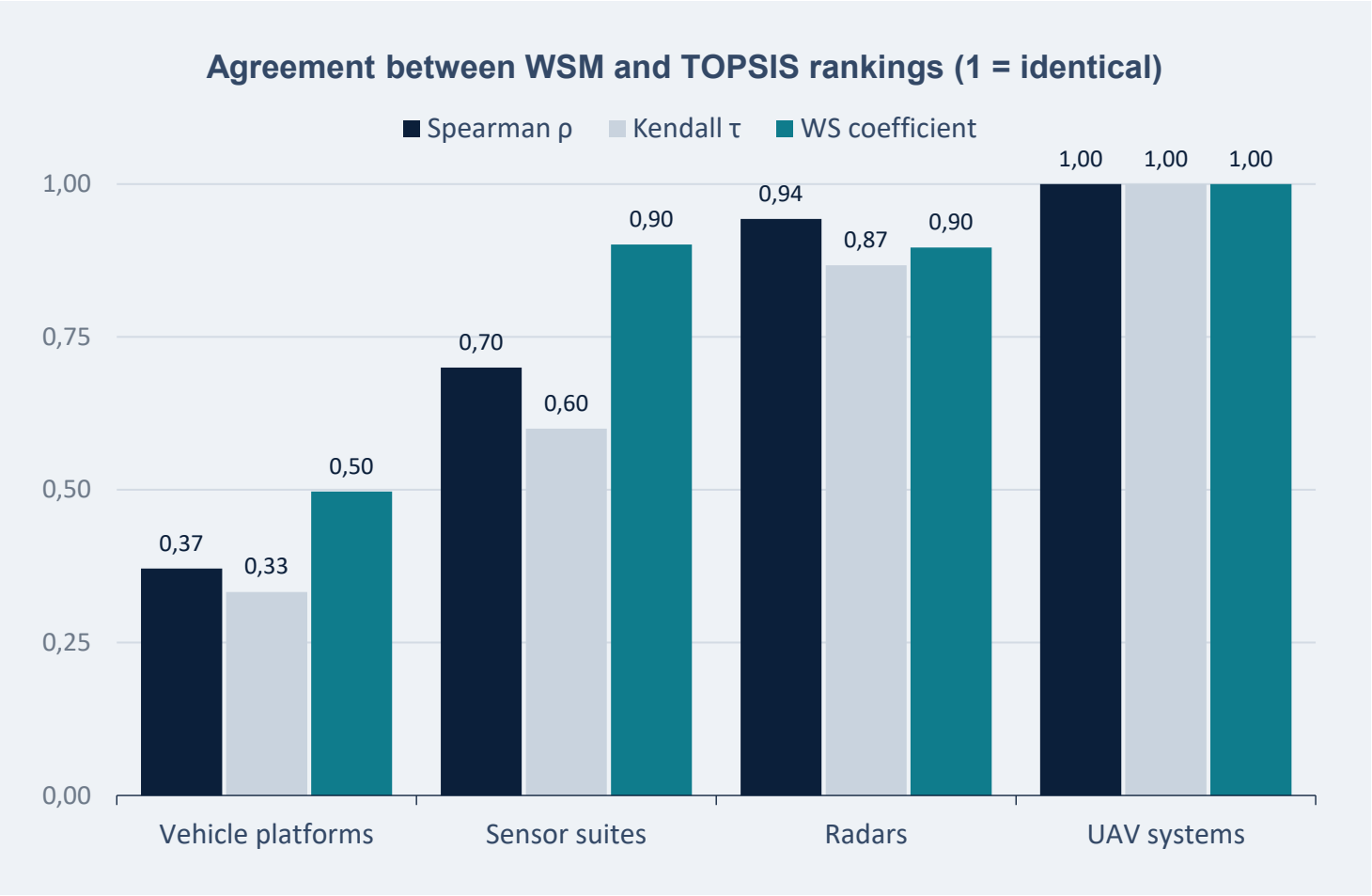
Weapon-locating radars



UAV systems



07 How firmly can each result be read?



Vehicle platforms

INDICATIVE

1 of 6 identical · max. shift 3

Sensor suites

FIRM AT THE TOP

2 of 5 identical · top two agree

Weapon-locating radars

METHOD-INDEPENDENT

4 of 6 identical · max. shift 1

UAV systems

IDENTICAL

4 of 4 identical

Descriptive values: with 4–6 systems, ρ and τ are not significance tests.

08 Vehicle platforms: Czech systems remain competitive

System	WSM	TOPSIS
LOV-Pz	0.419 (4)	0.510 (2)
LOS-M	0.628 (1)	0.468 (4)
PIRANHA 5	0.564 (2)	0.550 (1)
CV90 MkIV	0.358 (5)	0.498 (3)
ASCOD	0.522 (3)	0.457 (5)
VBMR Griffon	0.232 (6)	0.412 (6)

score (rank) · gold = in Czech service

0.093

TOPSIS spread of the five best platforms

No decisive winner

LOS-M first in WSM, LOV-Pz second in TOPSIS.

LOS-M: uneven profile

Excellent terrain mobility, weaker elsewhere: TOPSIS penalizes the imbalance.

Next platform choice

A balanced mix of mobility, range, speed and dimensions.

09 Sensor suites: the clearest limitation

System	WSM	TOPSIS
LOV-Pz suite	0.284 (3)	0.189 (4)
LOS-M suite	0.201 (4)	0.131 (5)
BAA II	0.359 (2)	0.259 (2)
Kate-LR	0.150 (5)	0.192 (3)
NERIO-ULR	1.000 (1)	1.000 (1)

score (rank) · gold = in Czech service

1.000

NERIO-ULR: best on every criterion, in both methods

Czech suites in the lower part

Recognition range carries the highest weight (0.410).

First place by dominance

Not by the choice of weights.

Modernization focus

Long-range recognition and identification, laser rangefinder range.

10 Radars: multifunction systems lead

System	WSM	TOPSIS
ARTHUR	0.186 (5)	0.432 (5)
ELM-2311 C-MMR	0.767 (3)	0.772 (2)
GM200 MM/C	0.967 (1)	0.927 (1)
AN/TPQ-53	0.417 (4)	0.442 (4)
COBRA	0.087 (6)	0.140 (6)
Giraffe 4A	0.865 (2)	0.677 (3)

score (rank) · gold = in Czech service

0.193

weight of air-surveillance range, which ARTHUR cannot score

ARTHUR 5th: partly category

A dedicated weapon-locating radar, not a counter-battery weakness alone.

Multifunction leads

Weapon location + air surveillance, coverage, fast deployment.

Next step

Sub-ranking on weapon-locating criteria only.

11 UAV systems: an identical ranking

System	WSM	TOPSIS
Puma 3 AE + Mantis i45	0.442 (3)	0.461 (3)
Vector AI + Raptor-360	0.456 (2)	0.554 (2)
ScanEagle + Dual Imager	0.741 (1)	0.615 (1)
AR3 EVO + HD55-MV	0.415 (4)	0.409 (4)

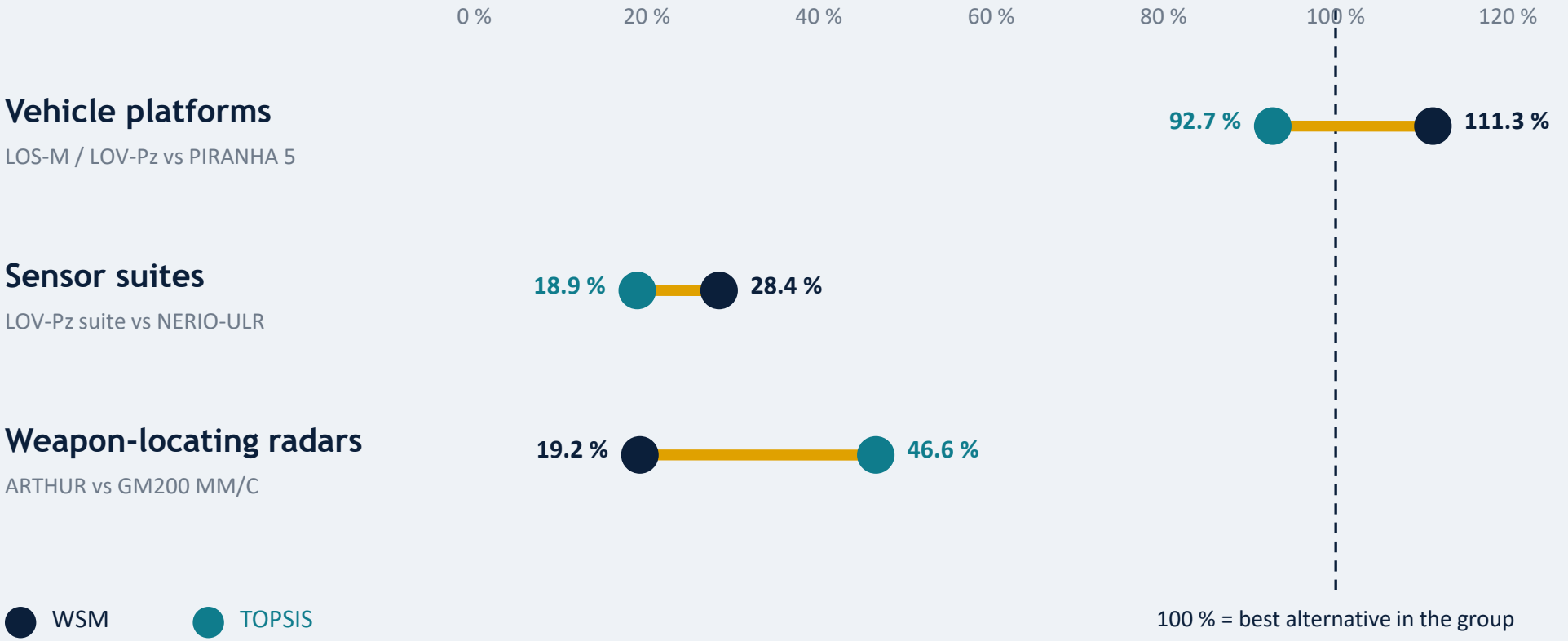
score (rank) · no Czech system in this group

4 of 4

same position under both methods

- **No organic UAV in Czech artillery**
  All four alternatives are market systems.
- **One system, three parts**
  Aircraft, data link and payload are assessed together.
- **Not scored yet**
  VTOL, survivability, launch and recovery, C2 integration.

12 Benchmark: position of the system in service



Read with care: 0 % is the weakest system in the sample, not “no capability”. Ratios are method-specific; compare within a group.

13

What follows for capability development

1

Report both methods

With uneven profiles, the aggregation principle matters. Show both rankings and their agreement.

2

Sensors before vehicles

For ground reconnaissance, sensor modernization likely brings more than new platforms.

3

Multifunction radars

Counter-battery support and UAV detection in one system.

4

An organic artillery UAV

Assessed as one system: long endurance, multisensor payload, C2 integration.

14 Limitations and the final paper

LIMITATIONS

- Declared, not measured, performance data
- 16 specialists from one artillery regiment
- Smaller panel for the pairwise comparisons
- Saaty consistency ratio not verified
- Equal mix of three weighting methods not tested
- Correlated criteria, e.g. detection / recognition / identification range

IN THE FINAL PAPER

- Full decision matrices with units and sources
- Consistency ratios for all Saaty matrices (threshold 0.10)
- Sensitivity of rankings to each weighting method
- Radar sub-ranking on weapon-locating criteria only
- Later: field verification and cost, logistics, life-cycle criteria

15 Conclusions

- Czech vehicle platforms remain competitive in mobility.
- The main limitation lies in the sensor suites: long-range recognition and identification.
- GM200 MM/C leads the radars, ScanEagle the UAV systems.
- Two methods plus their agreement show which results are firm.

Thank you. Questions?

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