



Credit: USMC

A Framework for Aligning Small UAS Technologies with Defense Acquisition Processes

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Project summary

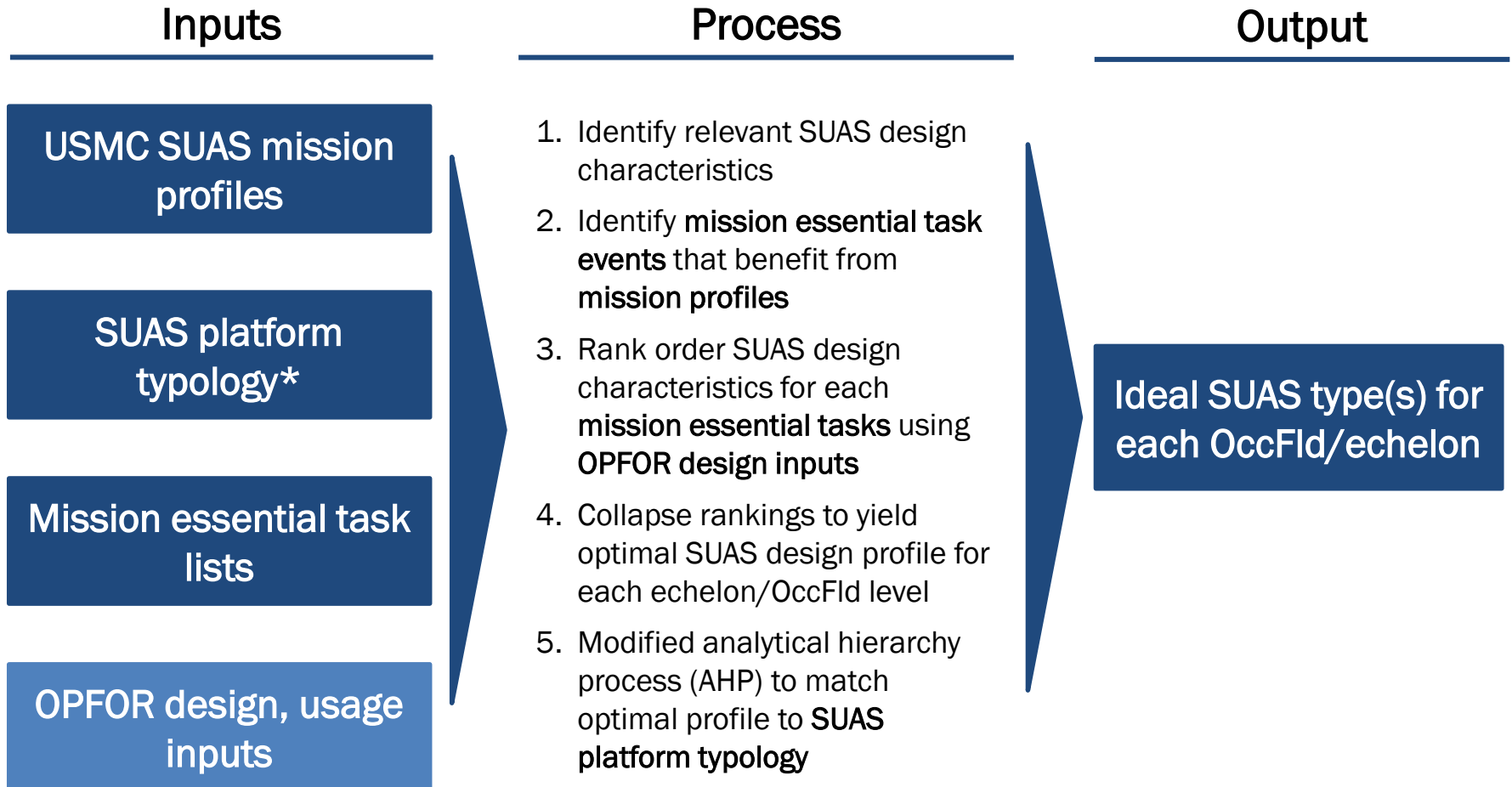
Project objective

Determine the required capability sets and the preferred mix of type and quantity of small unmanned aircraft systems (SUAS) within each unit of the command element (CE) and ground combat element (GCE), from squad to regimental level.

Key challenges

- Fast moving technology
- SUAS utility cuts across OccFlds and echelons
- Requirements process partially co-opted

Mixed methods approach needed to identify ideal SUAS platforms



OPFOR: operating forces

Interview, document analyses identified quantities

Procurement strategic goals

- Merge OPFOR and HQMC perspectives
- Spur further operational maturity for infantry, LAR communities
- Allow other communities to gain needed experience and access to platforms to determine true need

Inputs and assumptions

- Units developing concepts of employment were key source of quantity data
- Research team considered factors that may reduce quantities
 - Operational maturity
 - Availability of contracted support to pool platforms
 - Deployment cycles

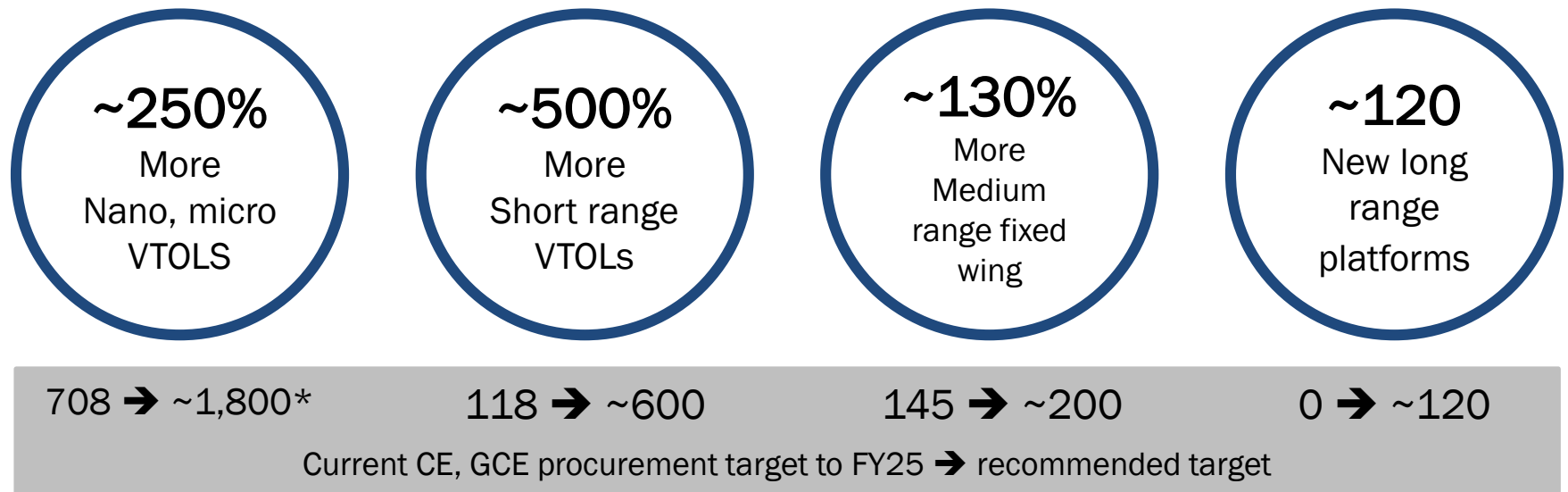
Field interviews indicate OccFlds have varying SUAS needs

	Situational awareness	Force protection	Rapid target engagement	Persistent C4	Persistent EW
Infantry	x	x	x	?	?
ANGLICO	x		x	?	
Artillery	?	?	x		
Communications	?	?		?	
LAR	x	x	x		
Armor	x	?			
Combat engineer	x			?	
Intelligence	?	?			
Law enforcement	?	?			
SIGINT	?	?			
Reconnaissance	?	?			
AAV	?				

Potential requirement

Command element unit
 x = demonstrated ability
 ? = RAND assessed need

Approach yielded more tailored SUAS investment than existing plan



Additional recommendations

- Divest from short range fixed wing platforms in CE and GCE units
- Allocate ~70% of all platforms to infantry units

* Summed total of Cat 2 and 3 platforms

Cat: category, CE: command element, GCE: ground combat element, LAR: light armored reconnaissance, VTOL: vertical take-off and landing



Example: current infantry SUAS partially equips battalion units (I/VI)

Current procurement target to FY25

	Cat 2 Nano VTOL	Cat 3 Micro VTOL	Cat 4 SR/SE VTOL	Cat 5 SR/SE FW	Cat 6 MR/ME FW	Cat 7 LR/LE FW
Infantry Bn	4	16	2	10	2	0

Our hypothesis from IPR 1 suggested that further opportunities exist to integrate SUAS into many OccFlds

“We haven’t gotten to the point where we actually use them. For me, I have done some of JTAC, I would be interested in it for targeting. If we had UAS with targeting abilities, that would be great. Also, for the general security of the team.”

GCE unit interview

“We wish we could tie SUAS into our systems more, but we’re not high enough on training list. Our system will activate if someone trips a sensor, we get a ten digit grid, I would love to be able to program that directly into the [SUAS].”

CE unit interview

SUAS categories ranked to relate them to T&R (II/VI)

SUAS categories ranked by design characteristics*

	Directionality	Cat 1 Tethered	Cat 2 Nano VTOL	Cat 3 Micro VTOL	Cat 4 SR/SE VTOL	Cat 5 SR/SE FW	Cat 6 MR/ME FW	Cat 7 LR/LE FW
Payload capacity	Heavier is better	2	4	4	3	3	2	1
Endurance	Longer is better	1	5	5	4	4	3	2
Speed	Faster is better	5	4	3	2	2	1	1
Range	Longer is better	6	5	4	3	3	2	1
Weight	Less is better	6	1	2	3	4	4	5
Launch	More options are better	3	2	2	2	1	1	1
Recovery	More options are better	3	2	2	2	1	1	1
VTOL	VTOL better	3	1	1	1	2	2	2

Which platforms best enhance infantry operational effectiveness?

Source: RAND analysis of EOTACS RFI to industry

*SUAS categories were ranked based on threshold performance specifications. If categories had identical specs, rankings were shared as well

SUAS design elements compared to relevant T&R events (III/VI)

Example T&R SUAS design characteristic ranking

Event Code	Task	Situational Awareness					
		Weight	Speed	Endurance	Payload Weight	Launch	Recovery
INF-MAN-7001	Conduct a ground attack	4	2	1	3	5	5
INF-MAN-7101	Conduct a position defense	3	2	1	2	4	4

User question 13: Can you rank the most critical design features of a SUAS?

Example response: *“Range is huge....If we could improve battery life we’d have to bring Raven down less often, that [would] be best”*

Rankings informed by interview responses on design elements and SUSAE tactical situations

Rankings averaged to find best overall SUAS profile (IV/VI)

	Situational awareness						Force protection					
	Wt	Spd	End	P-Wt	Lnch	Rvry	Wt	Spd	End	P-Wt	Lnch	Rvry
INF-MAN-6102 Conduct a mobile defense	4	2	1	3	5	5	4	2	1	3	5	5
INF-MAN-6103 Conduct retrograde	4	2	1	3	5	5	4	2	1	3	5	5
INF-MAN-6201 Operate in an environment with an Improvised Explosive Device (IED) threat	4	2	1	3	5	5	4	2	1	3	5	5

T&R rankings averaged and rounded up to nearest whole number by echelon, OccFld...

...then averaged across mission profiles; most important mission identified by interviewees weighted 1.5x

Result is a single design prioritization profile for each echelon within an OccFld

We compared the ideal design elements to SUAS categories (V/VI)

Summarized OccFld/echelon rankings

	Infantry Co	Infantry Bn
Endurance	1	1
Speed	3	2
Weight	2	4
Payload	4	3
Launch	5	5
Recovery	5	5
Match(es) by category	6 4 3	7

- Top ranked design elements were matched with SUAS categories sharing same rank
- Remaining elements then matched with closest categories
- Multiple platforms considered when OccFld/echelon design element rankings conflicted with SUAS categories

Quantities identified from user inputs, then adjusted (VI/VI)

Quantity inputs

Interview comments

After action reports
(AARs)

Unit CONOP slides

Future organization
(Marine Operating
Concept)

Current unit
organization

Intermediate output (partial example)

Unit name	Cat 2 Qty	Cat 3 Qty
H&S CO 1/7 1ST MARDIV	0	0
WPNS CO 1/7 1ST MARDIV	0	0
RFL CO A 1/7 1ST MARDIV	0	9
RFL CO B 1/7 1ST MARDIV	0	9
RFL CO C 1/7 1ST MARDIV	0	9

- Cat 3 usage indicated that all rifle squads should possess them.
- Intermediate output did not highlight need for Cat 2 nano VTOLs, although interviews suggested their utility for short range situational awareness.
- Wpns Company sniper teams would also benefit from nano VTOLs; adjustments made.

Adjusted output (partial example)

Unit name	Cat 2 Qty	Cat 3 Qty
H&S CO 1/7 1ST MARDIV	0	0
WPNS CO 1/7 1ST MARDIV	3	0
RFL CO A 1/7 1ST MARDIV	9	9
RFL CO B 1/7 1ST MARDIV	9	9
RFL CO C 1/7 1ST MARDIV	9	9

CE units focus on increasing access

Recommended allocation, additional procurement target to FY25

	Cat 2 Nano VTOL	Cat 3 Micro VTOL	Cat 4 SR/SE VTOL	Cat 5 SR/SE FW	Cat 6 MR/ME FW	Cat 7 LR/LE FW
ANGLICO	0	0	~10	-18	~-10	~10
Communications	0	0	0	0	~15	0
Intelligence	0	0	9	-6	0	0
Law enforcement	0	0	~30	0	0	0
Radio Bn	0	0	0	0	0	~5
Total additional procurement	0	0	~40	-24	~5	~15

- Transitioning from Cat 5 to Cat 4 platforms for Intel Bn ground sensor platoons will increase responsiveness for investigating sensor pings
- ANGLICO will benefit from increased range and endurance that Cat 7 platforms offer

GCE units focus on maturing CONOPs and increasing access

Recommended allocation, additional procurement target to FY25

	Cat 2 Nano VTOL	Cat 3 Micro VTOL	Cat 4 SR/SE VTOL	Cat 5 SR/SE FW	Cat 6 MR/ME FW	Cat 7 LR/LE FW
AAV Bn	0	0	0	0	~30	0
Artillery	0	0	~50	0	~-30	20
Combat engineer	0	0	~100	-15	0	0
Infantry	~750	~650	~400	-312	~70	~50
LAR	0	~200	0	-16	~-20	~40
Reconnaissance	~100	~100	0	-14	~-10	0
Armor	0	0	0	-10	~-10	10
Total additional procurement	~850	~950	~550	-367	~30	~120

- Cat 2-4 platforms' VTOL capability provides significant flexibility and utility primarily for situational awareness
- New Cat 7 platforms provide enough range to support LAR, tank, and artillery operations; infantry will benefit from increased payload carrying capacity