Supersonic Hovering Aerial Vehicle (SHAV):
Recoverable, Strategic Reach VTOL Weapon System at High Mach with Sub-Meter Precision

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Joint Armaments Conference, Exhibition and Firing Demonstration
Seattle, Washington 16 May 2012

Outline:

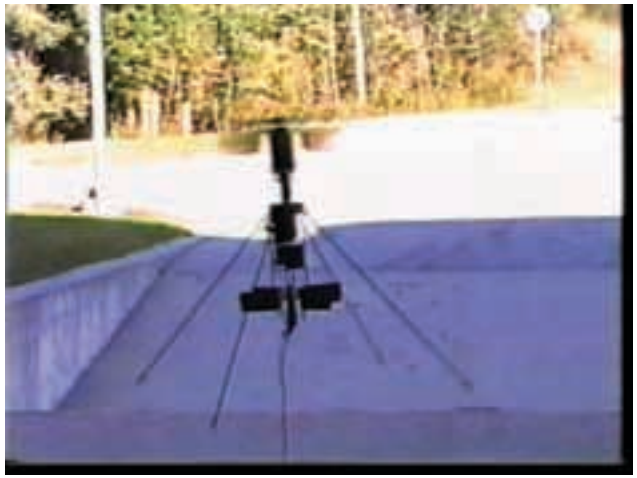
I. Hovering Precision Weapon History

II. Revolutionary Missions

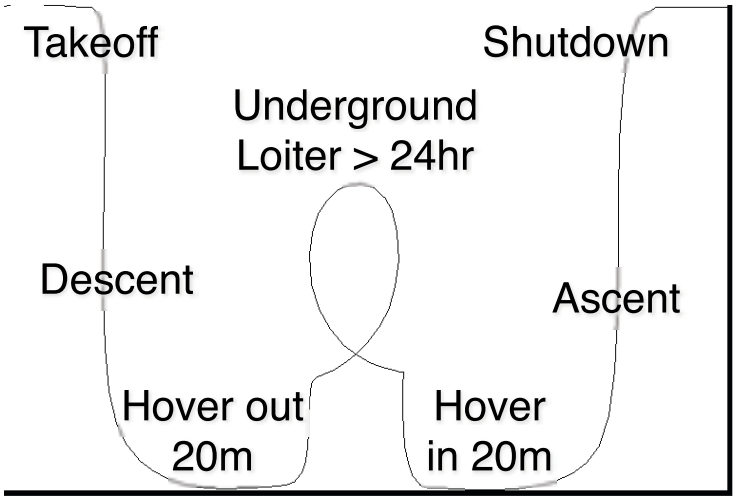
III. Design Space & Ways Forward

I. History

1st Micro Aerial Vehicle -- DoD CounterDrug Technology Office 1994 - 1997



Mission Profile:

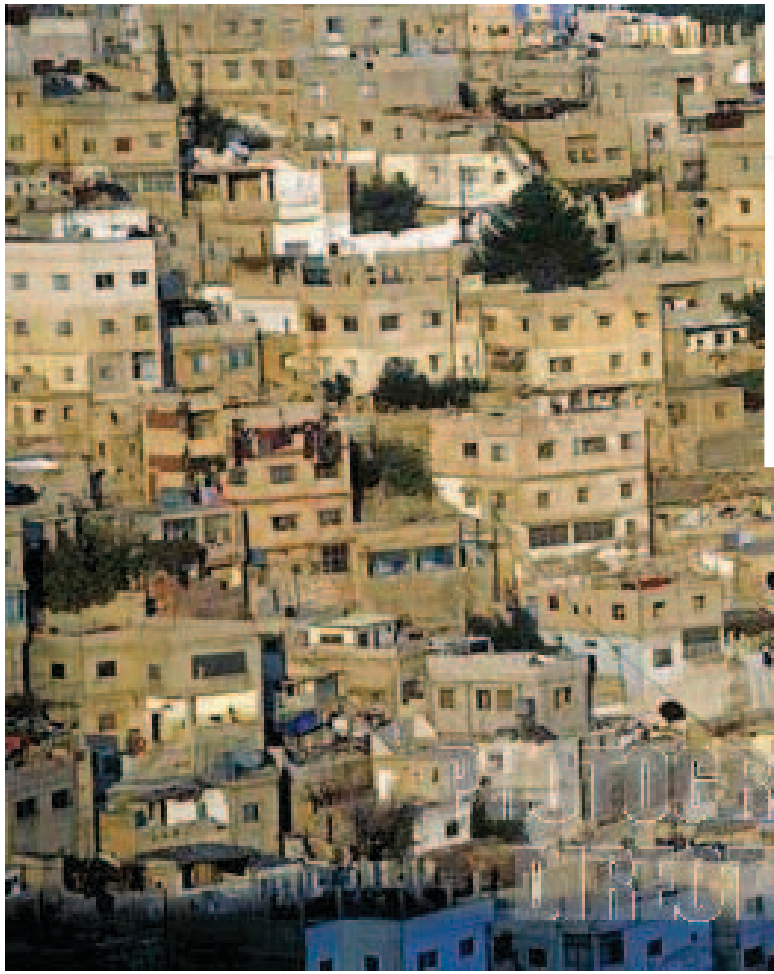


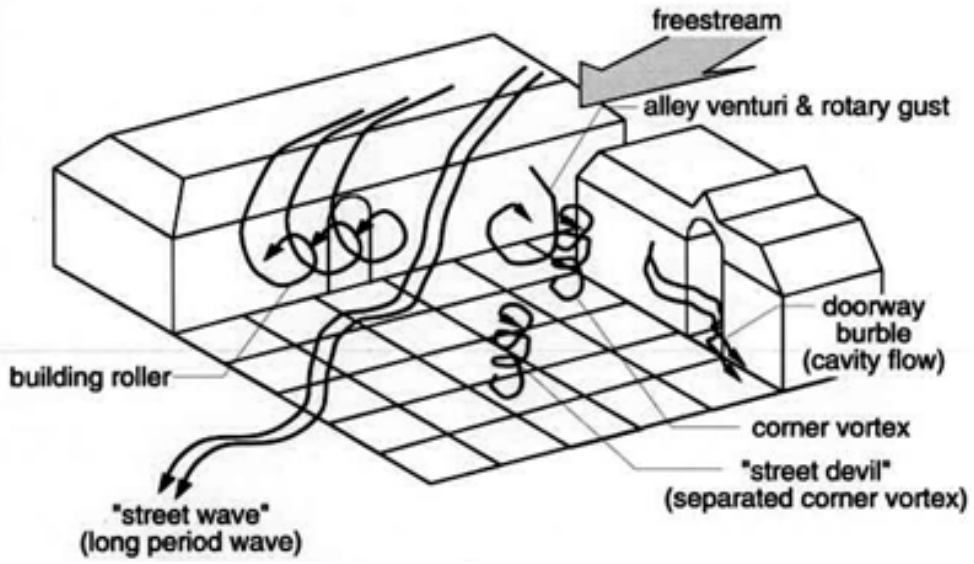
Kolibri Flight

I. History

Low-Level Operations: Serious trouble for UAVs...

DARPA Urban & Sub-Canopy Atmospherics Survey 1998



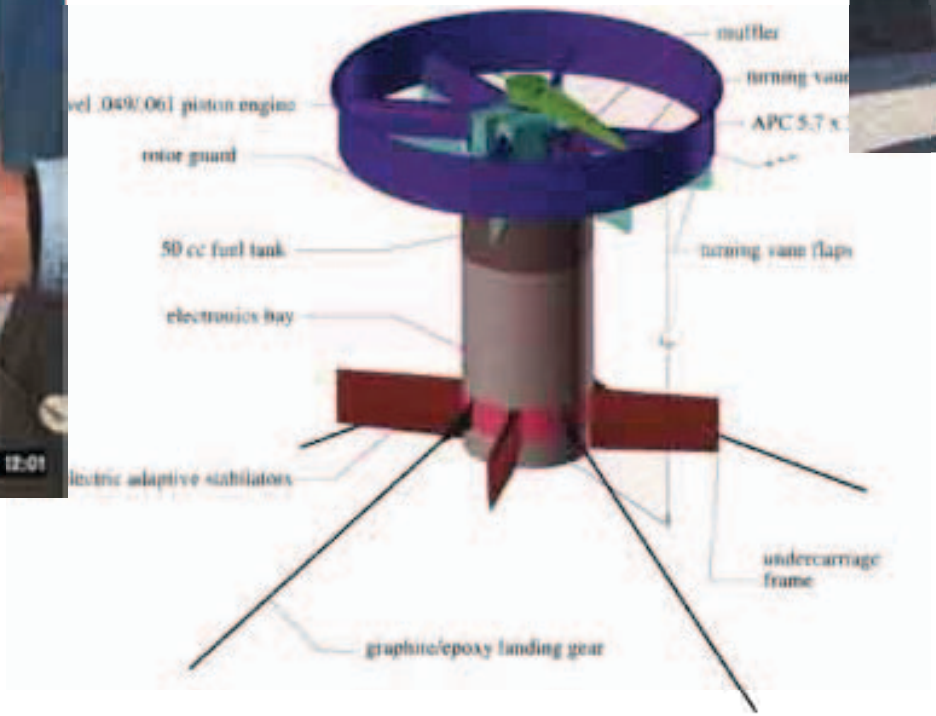


a >90° is a common event

I. History

First Free-Flight VTOL MAVs

6” (15cm) VTOL Coleopter



DARPA
1999 - 2000
Flyoffs @
MacDill &
Quantico

LuMAV Flight

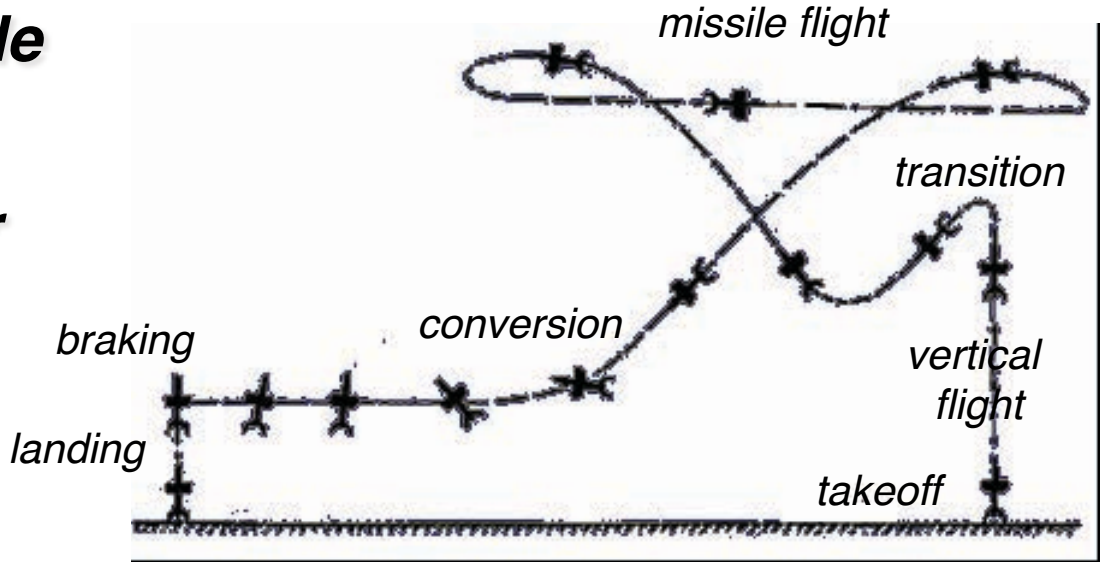
I. History

Paradigm Shift... Hypermaneuverable UAVs

Hover in more places than a helicopter

Fly as fast as a missile

Convertible Coleopter Configurations



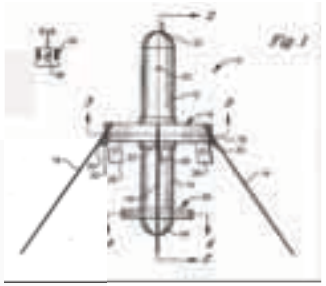
Heinkel Wespe 1944
(concept only, never built)

Heinkel Lerche 1944 (concept only, never built)

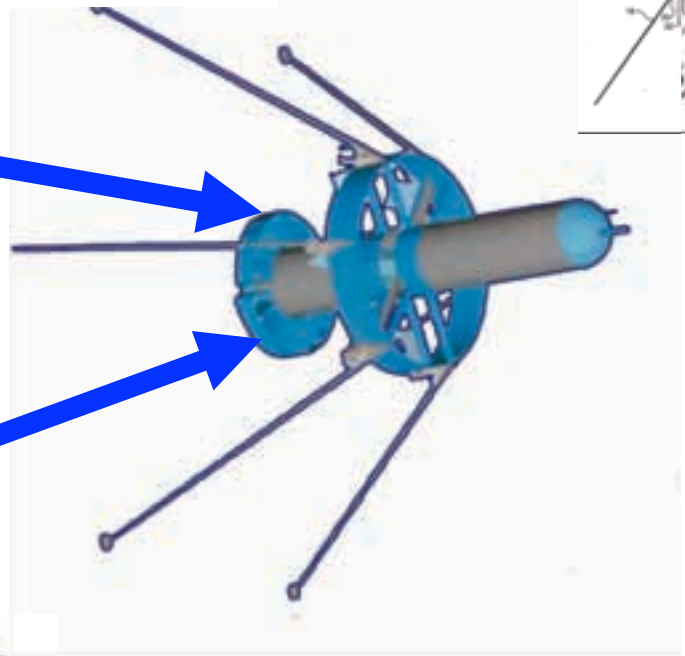
US Pat. 6,502,787

I. History

XQ-138 Program 2001 -



more control authority needed for MOUT environment

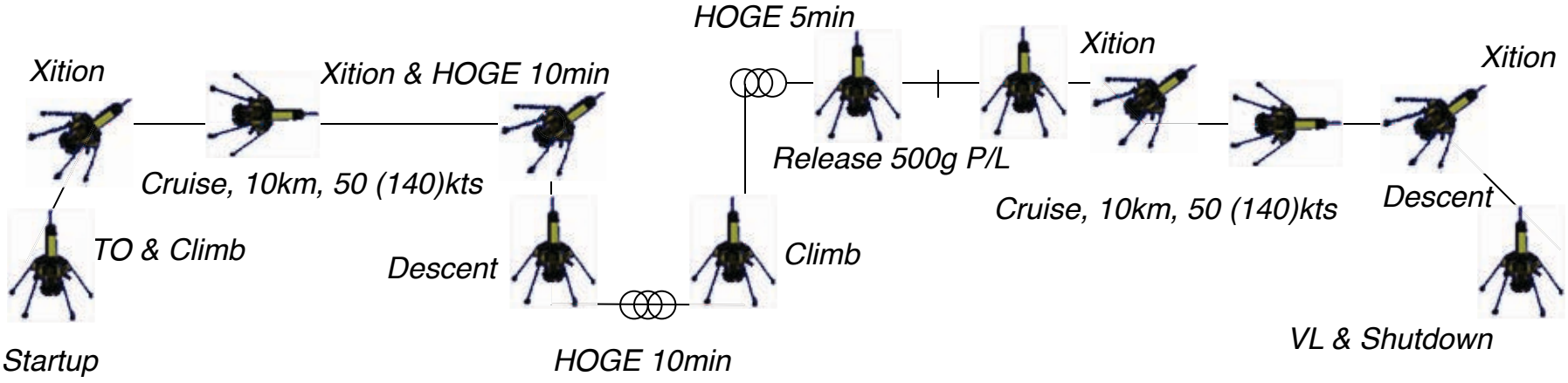


AA-12 (R-77)
(Aamraamski)

high control authority grid/lattice fins

I. History

XQ-138 Hypermaneuverable UAV Mission Profile



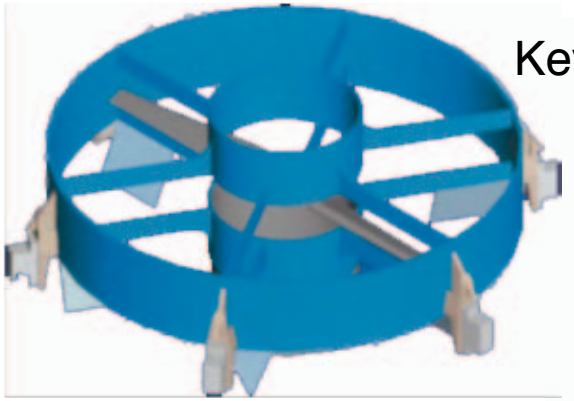
Mission Specification:

- Max. gross weight: 6.8lb (3.1kg)
- Max.payload weight: 2.2 lb (1kg)
- All weather capable
- 12”/hr (31cm/hr) rain
- 25+ kt gust penetration
- Sandstorm capable to 100kts
- Vmax 140kts for 1hr (blue sky)
- -40/100°F (38°C), 100% humidity
- Combat shotgun resistant @5m
- 15g MOUT wall strike
- Sensors: B/W 0.001 lux, Color 0.1 lux,FLIR
- Land + autostart
- Flight modes: 1st, 3rd person, fully autonomous w/waypoint nav.

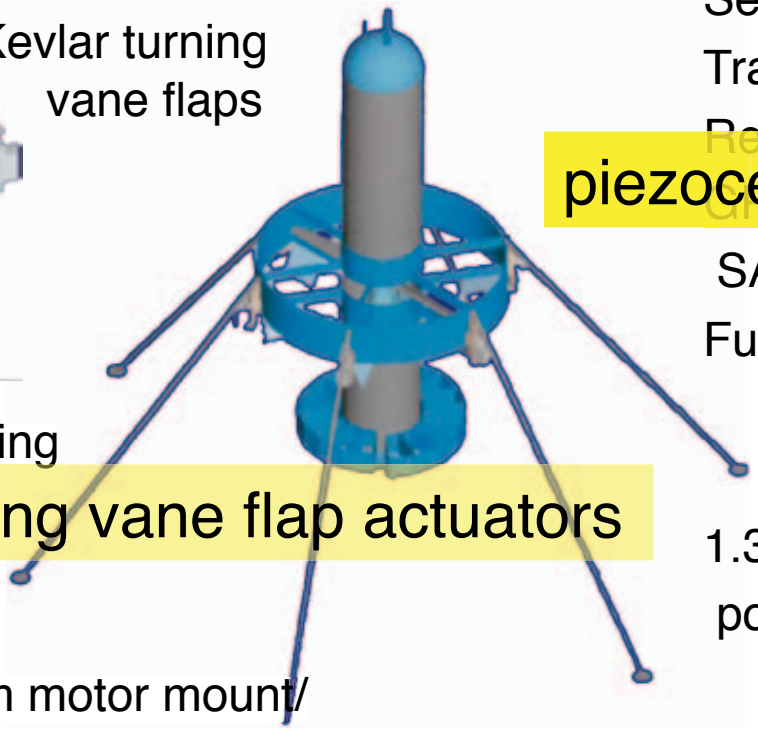
I. History

MDO using best currently available technology

ballistic graphite & boron structure



Kevlar turning vane flaps



Sensor

Transmitter

Receiver

piezoceramic gyros

GPS Navigator

SAS system

Fuel tank

titanium powerplant housing

piezoceramic turning vane flap actuators

1.3hp (970W) powerplant

magnesium motor mount/ fuselage coupler flight control actuators

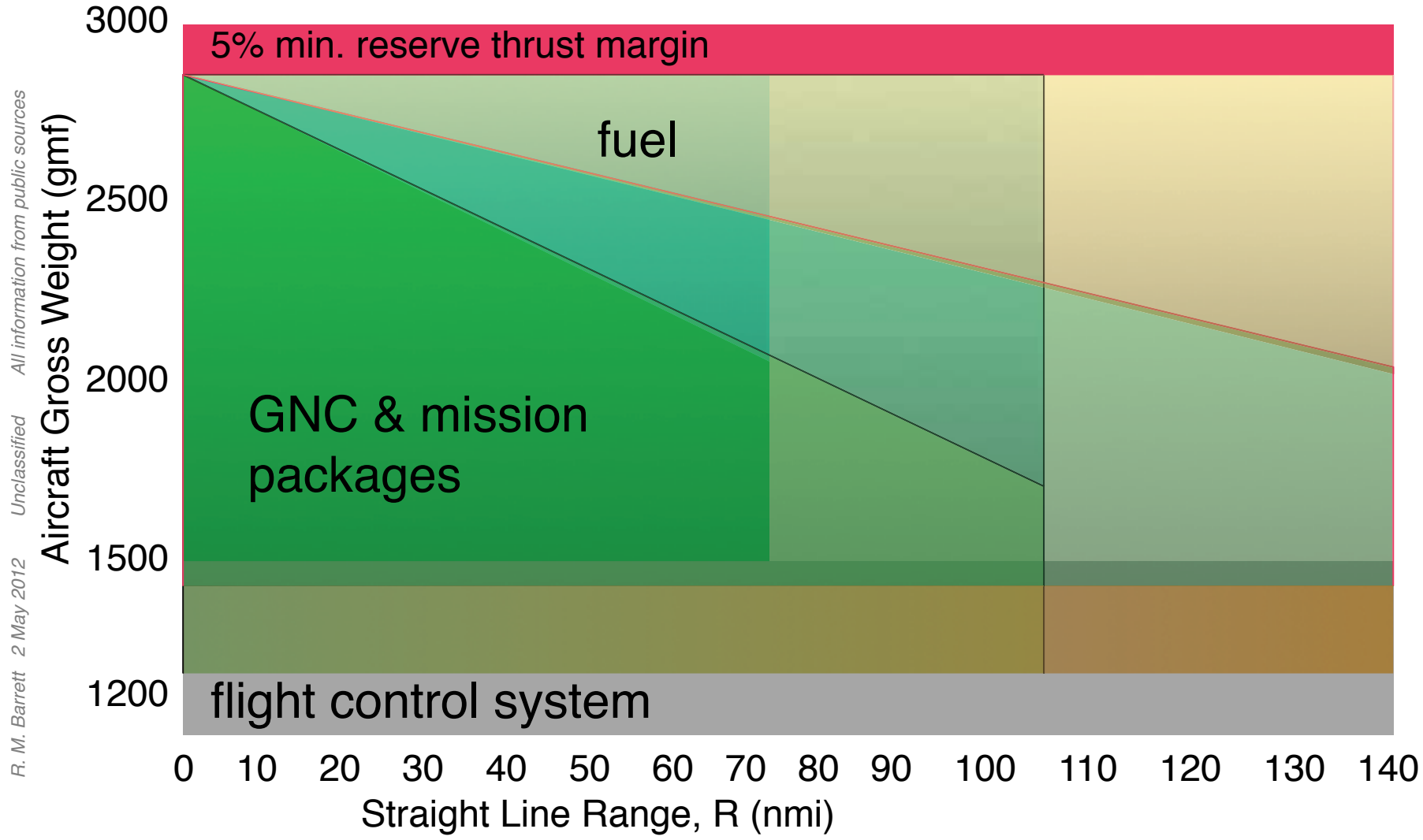
Muffler ass'y

graphite racking grid fins

piezoceramic grid fin actuators

I. History

XQ-138 Payload-Range Diagram



I. History

Demos for Non-DARPA Entities

US Navy
SPAWAR

US Army
Redstone Arsenal (TOW Range)
Ft. Benning (McKenna MOUT Site)
Ft. Eustis (Night Vision Lab)

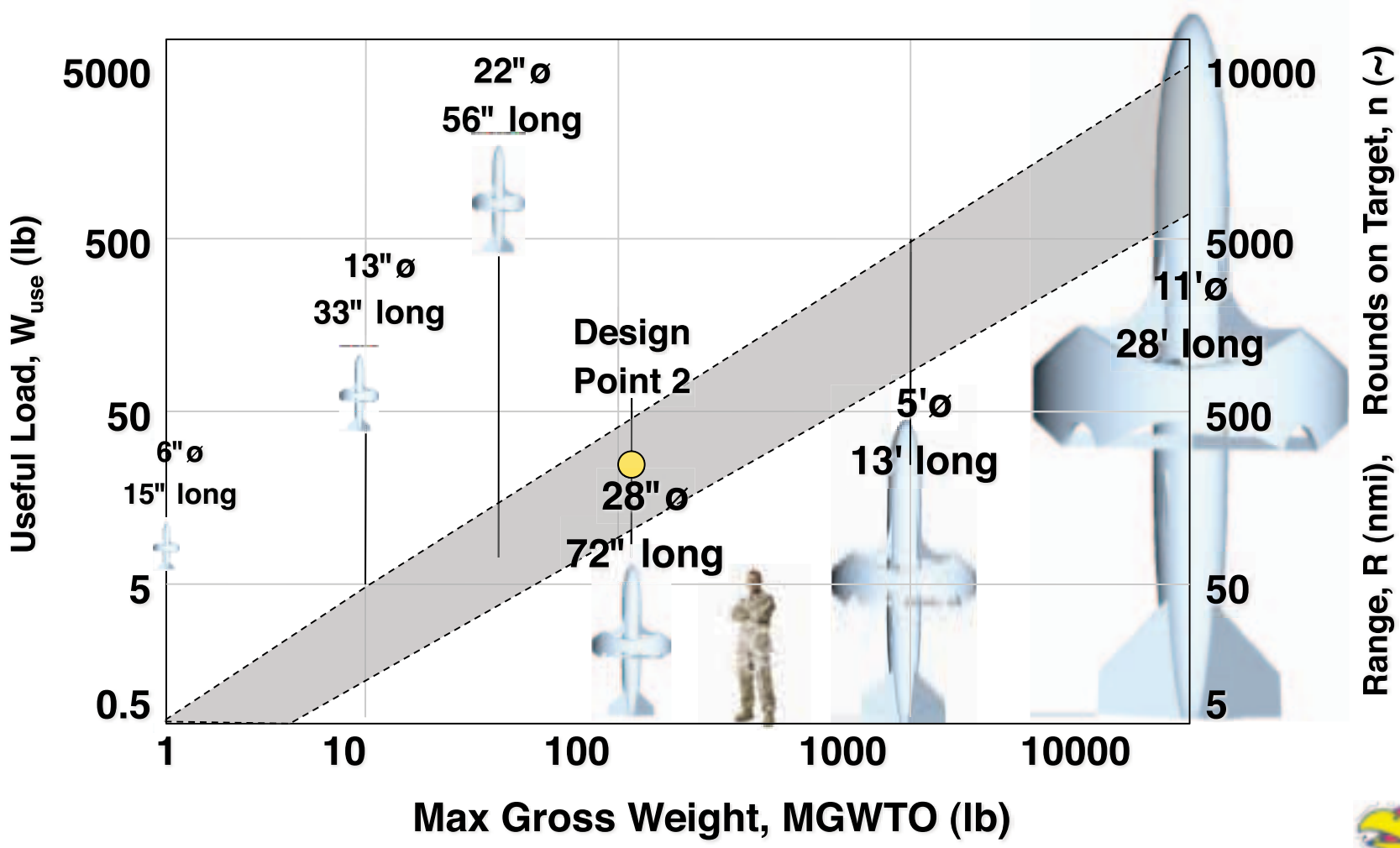
US Marine Corps
Quantico USMC Base

US Air Force
Patrick, MacDill (Special Forces)
Eglin AFB (Hellfire Range)

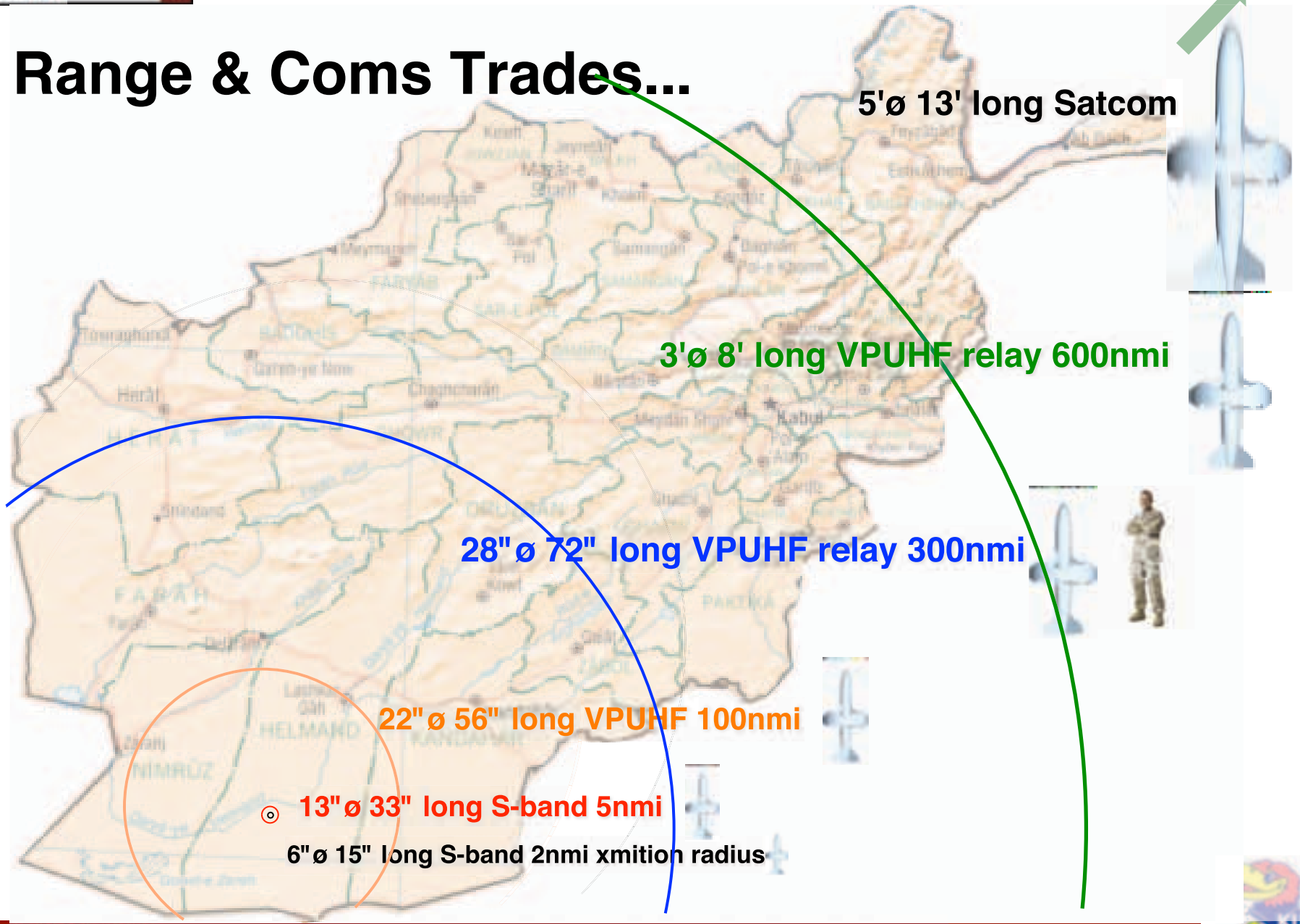
Revolutionary Missions

- Collocated Close Air Support (CCAS)
- PSYOP, force multiplier, perch & rest/stare/listen etc.
- Visual, Acoustic & RF signature suppression
- Hovering Precision Weapon (HPW) & stalking mines
- Counter IED, BDA, lethal/nonlethal counterpiracy
- High Precision Air Rapid (HiPAR) Cargo Delivery System?

XQ-381 Rubber Design General Sketch Growth, Range, Payload



Range & Coms Trades...



FAQ-381 Design Point 2 – 100lb MGWTO

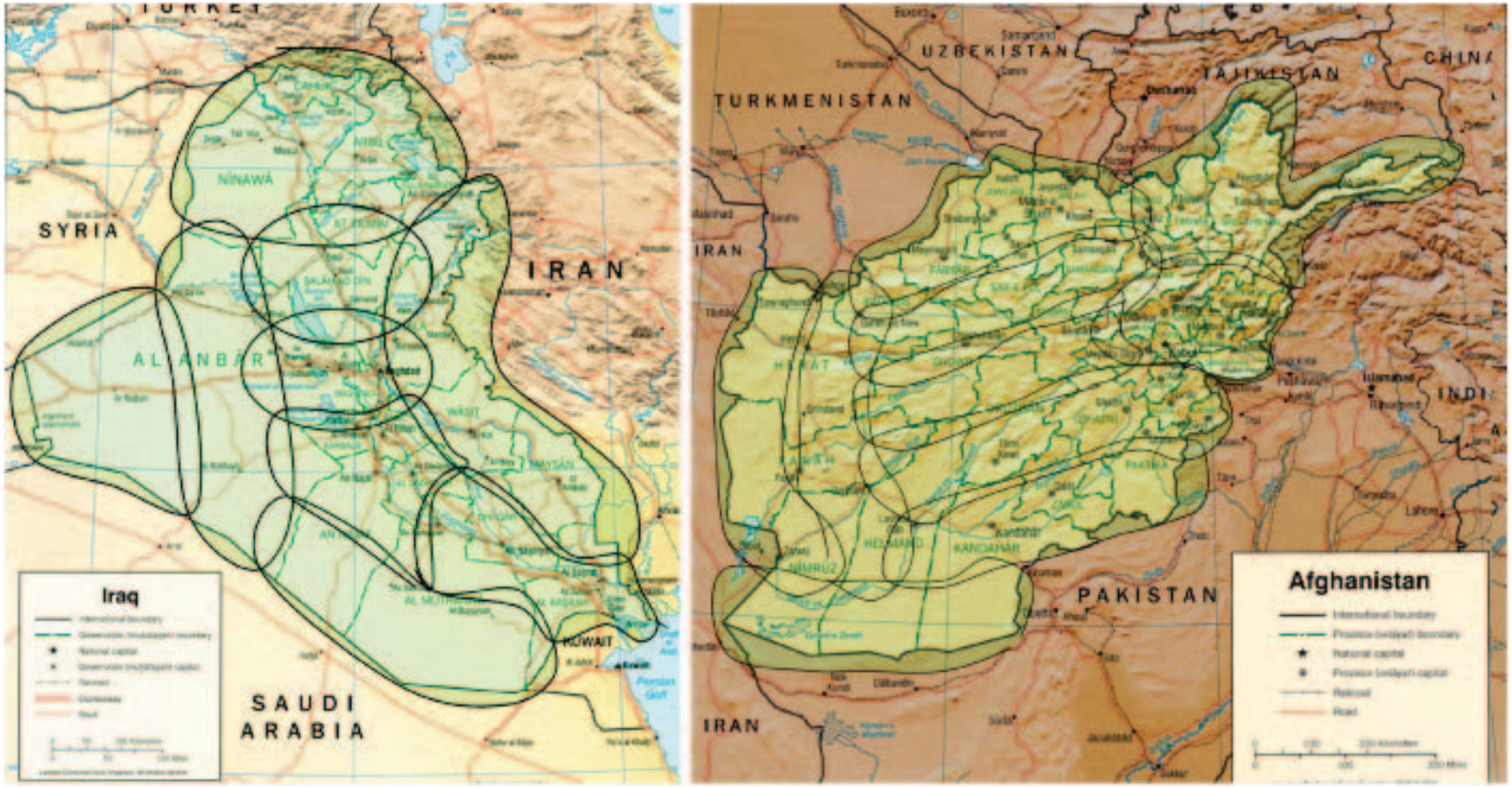
Enhanced Mission Specs:

- MGWTO ~100 lb
- >3hr HOGE
- 500nmi radius @ V_{BR}
- Large Sector Coverage
- Full sensor & coms suites
- Collocated Close Air Support
- Combat resistant
- Vmax > 450kts
- >5hr Vbr Loiter

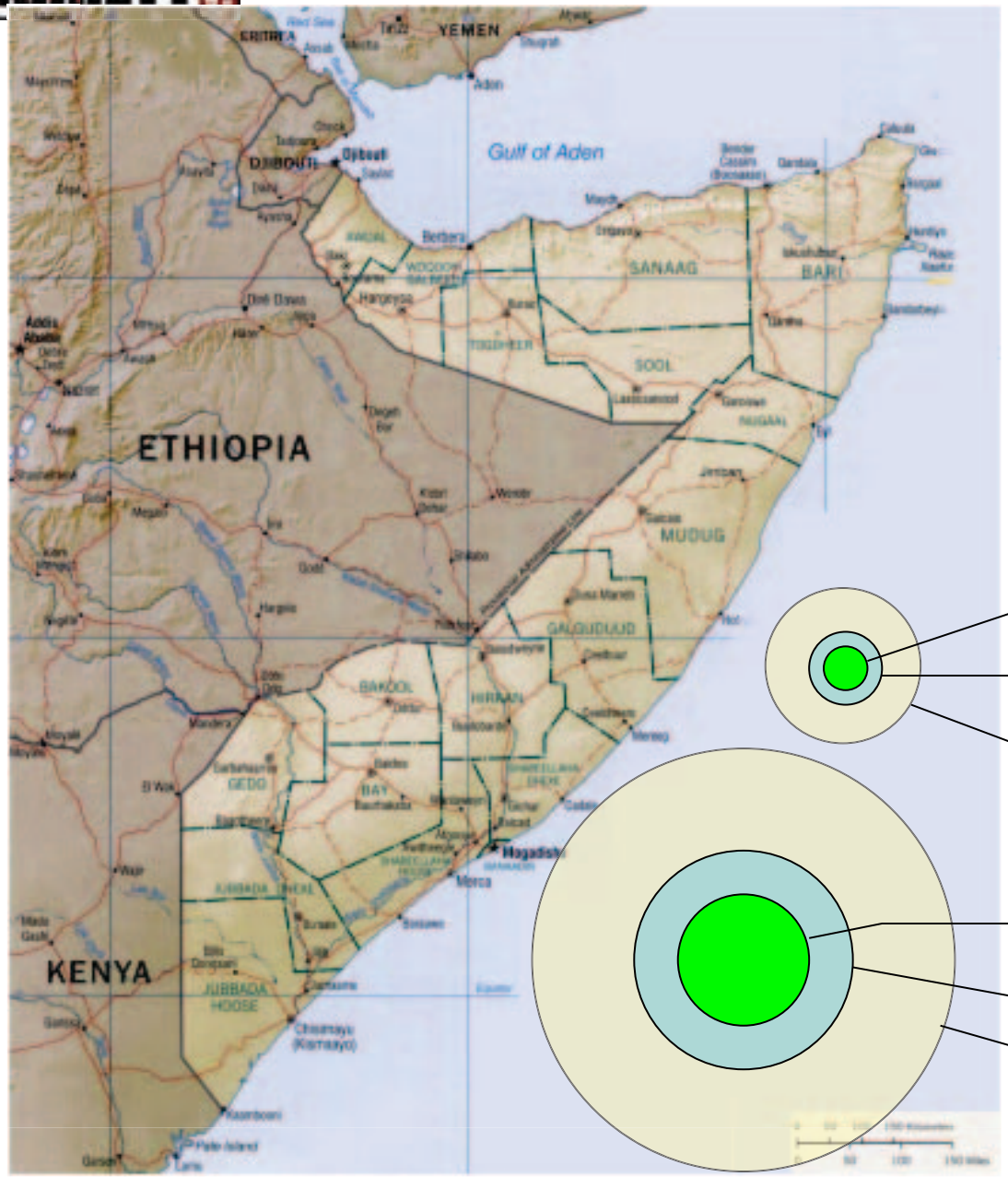
FAQ-381$_{DP1}$ 5 min TIC Response CCAS

9 Track Coverage for Iraq

10 Track Coverage for Afghanistan



The Next Generation: FAQ-381$_{DP1}$ Counterpiracy



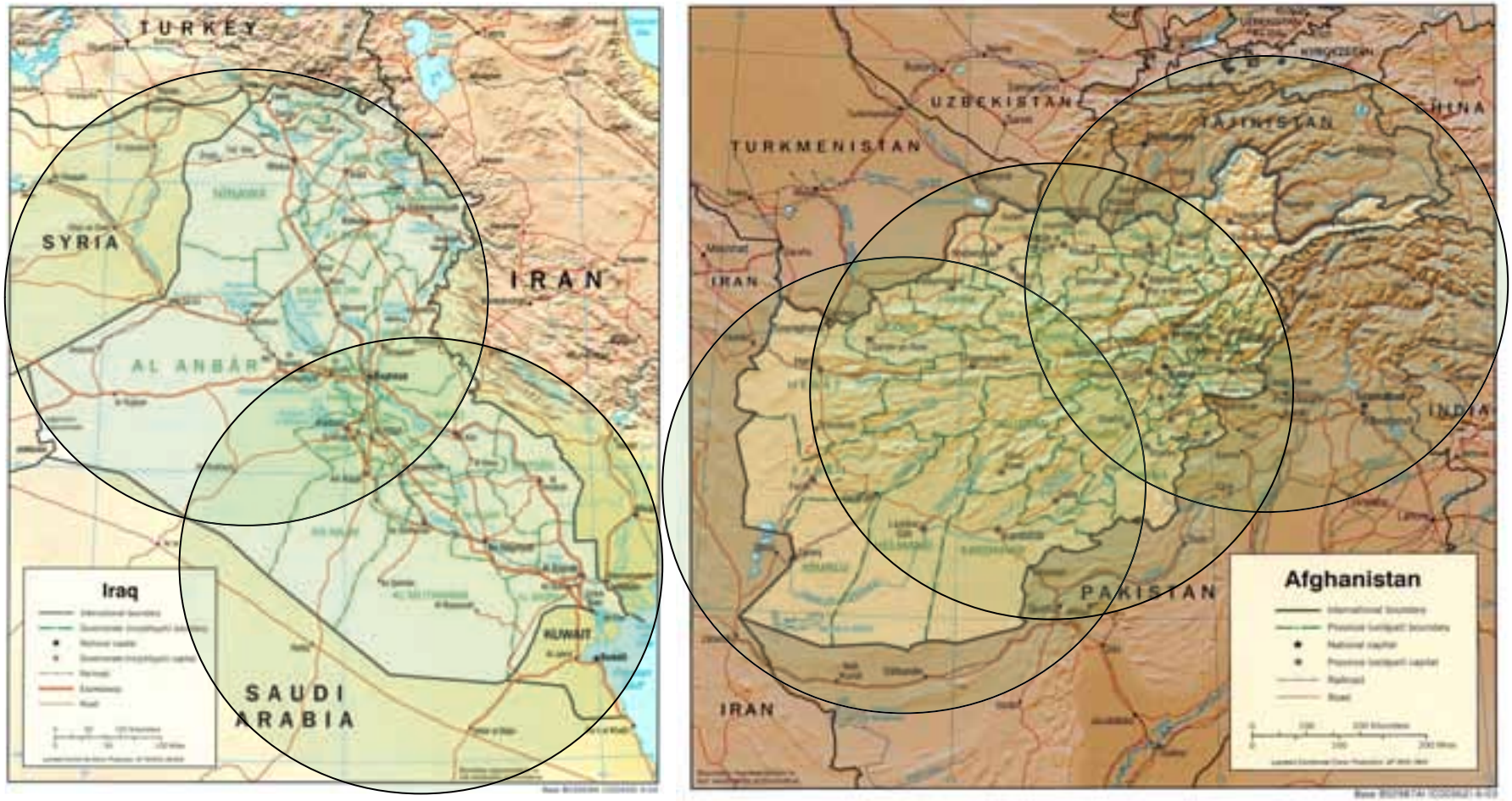
SH-60 Intercept Range

- 15 min
- 30 min
- 1 hr

FAQ-381 Intercept Range

- 15 min
- 30 min
- 1 hr

FAQ-381 Design Point 2 – 100lb MGWTO



FAQ-381 Design Point 3 – 1000lb MGWTO

Enhanced Mission Specs:

- MGWTO ~1000 lb
- >3hr HOGE
- 5000nmi radius @ V_{BR}
- Large Sector Coverage
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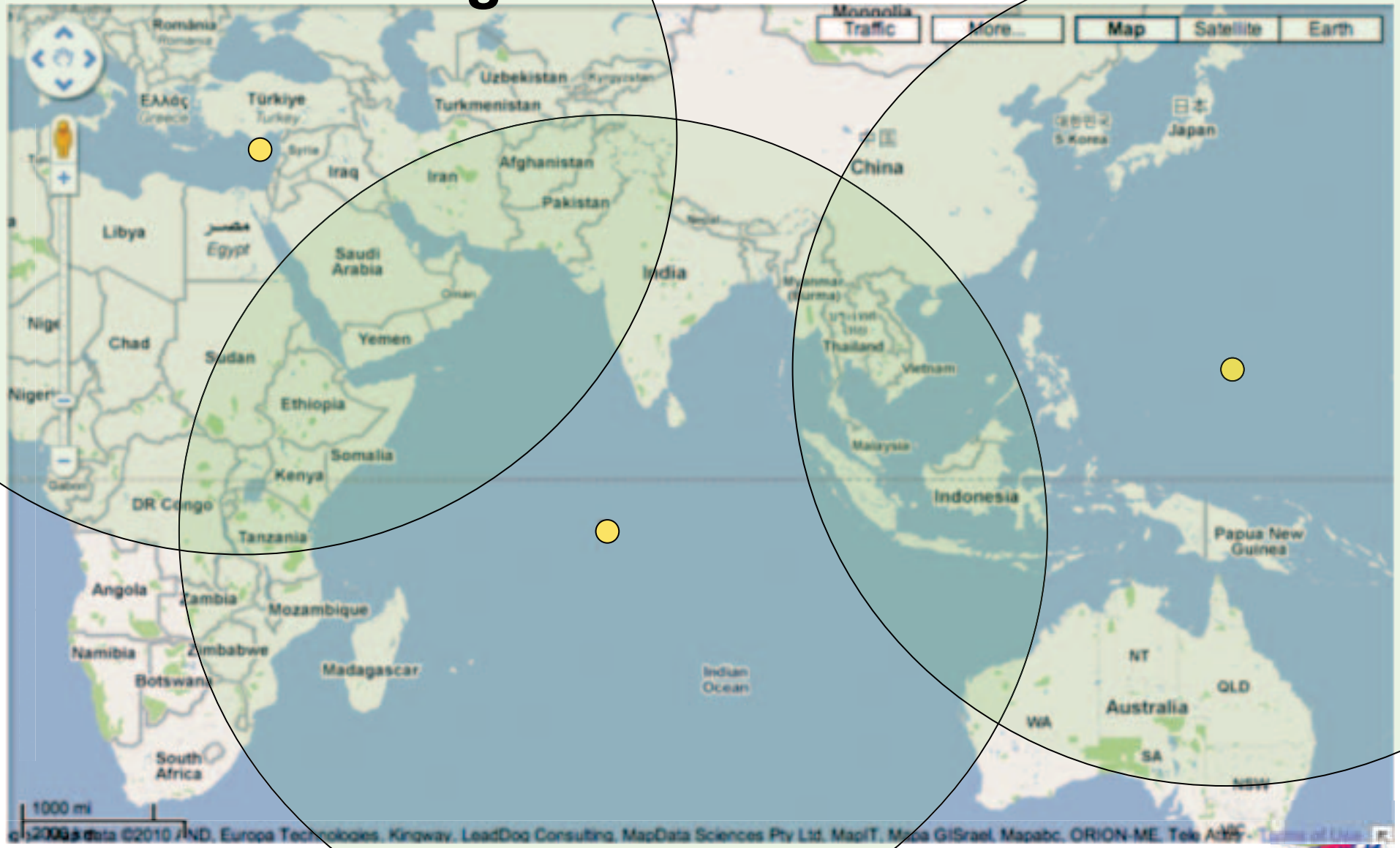
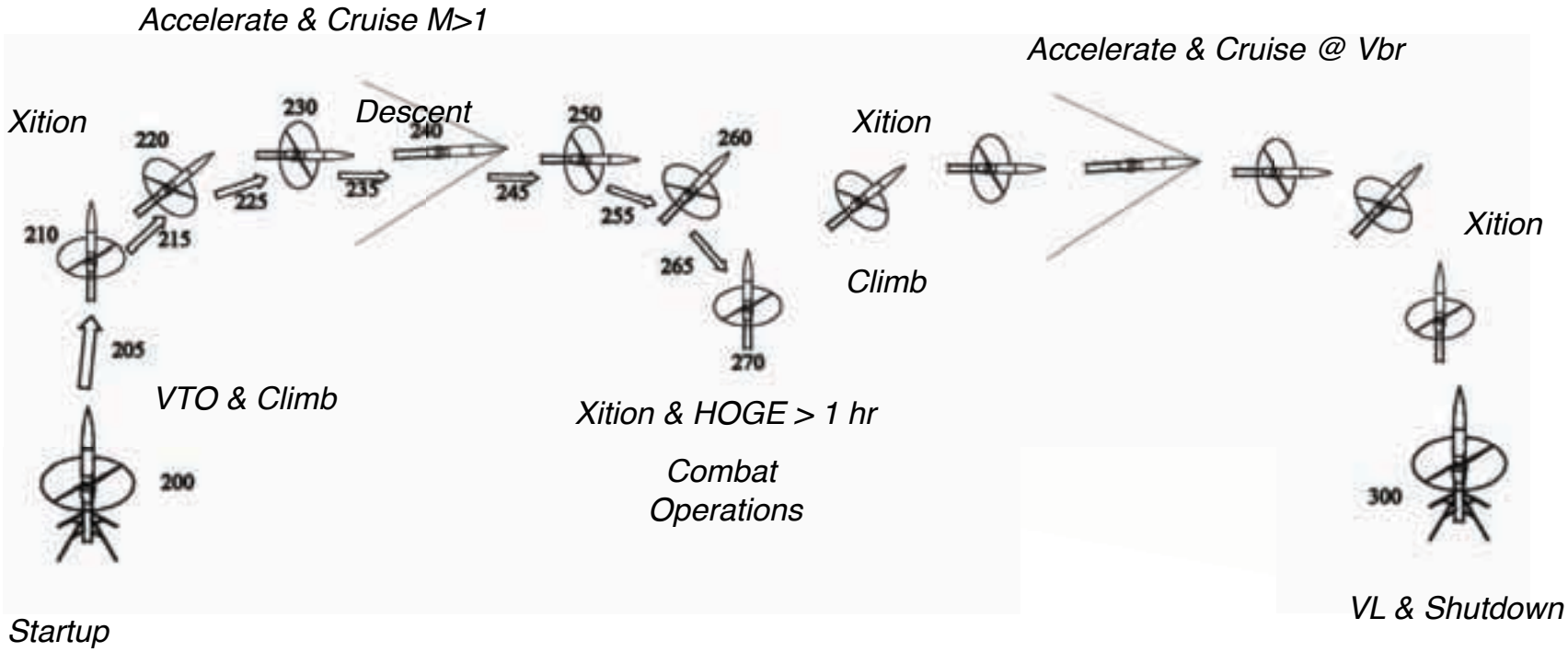
FAQ-381 Design Point 3 – 1000lb MGWTO

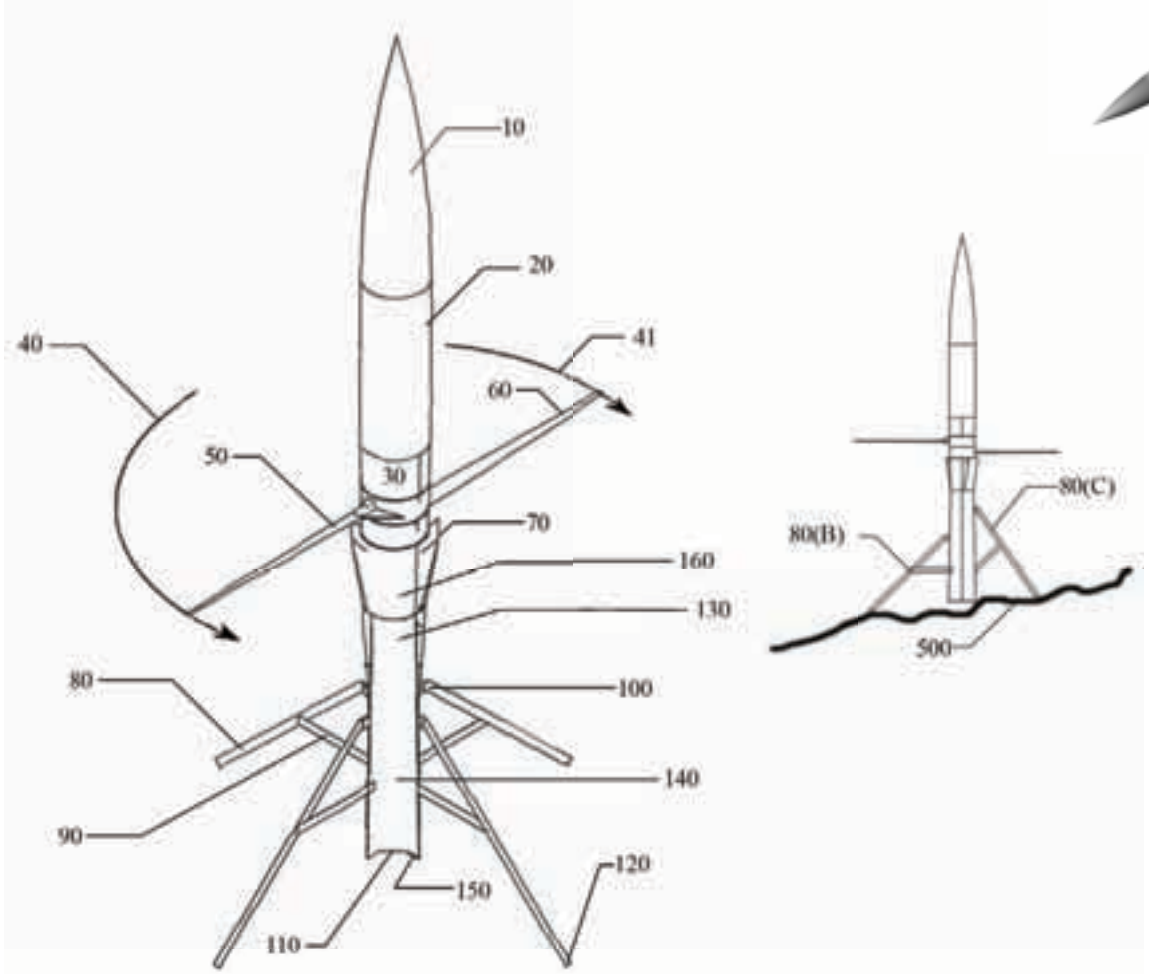


Supersonic Hovering Air Vehicle (SHAV)



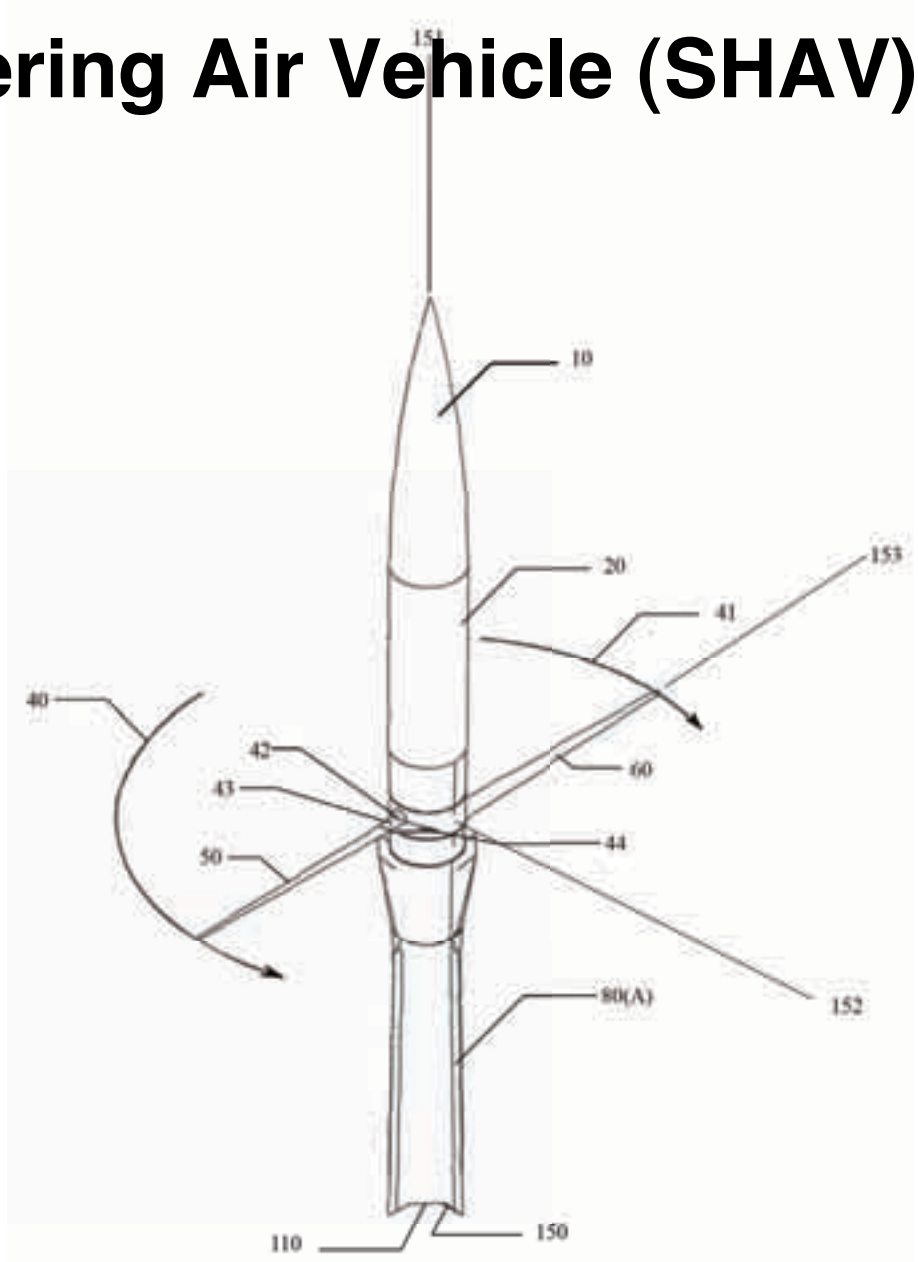
Supersonic Hovering Air Vehicle (SHAV)

Basic Configuration - Landing

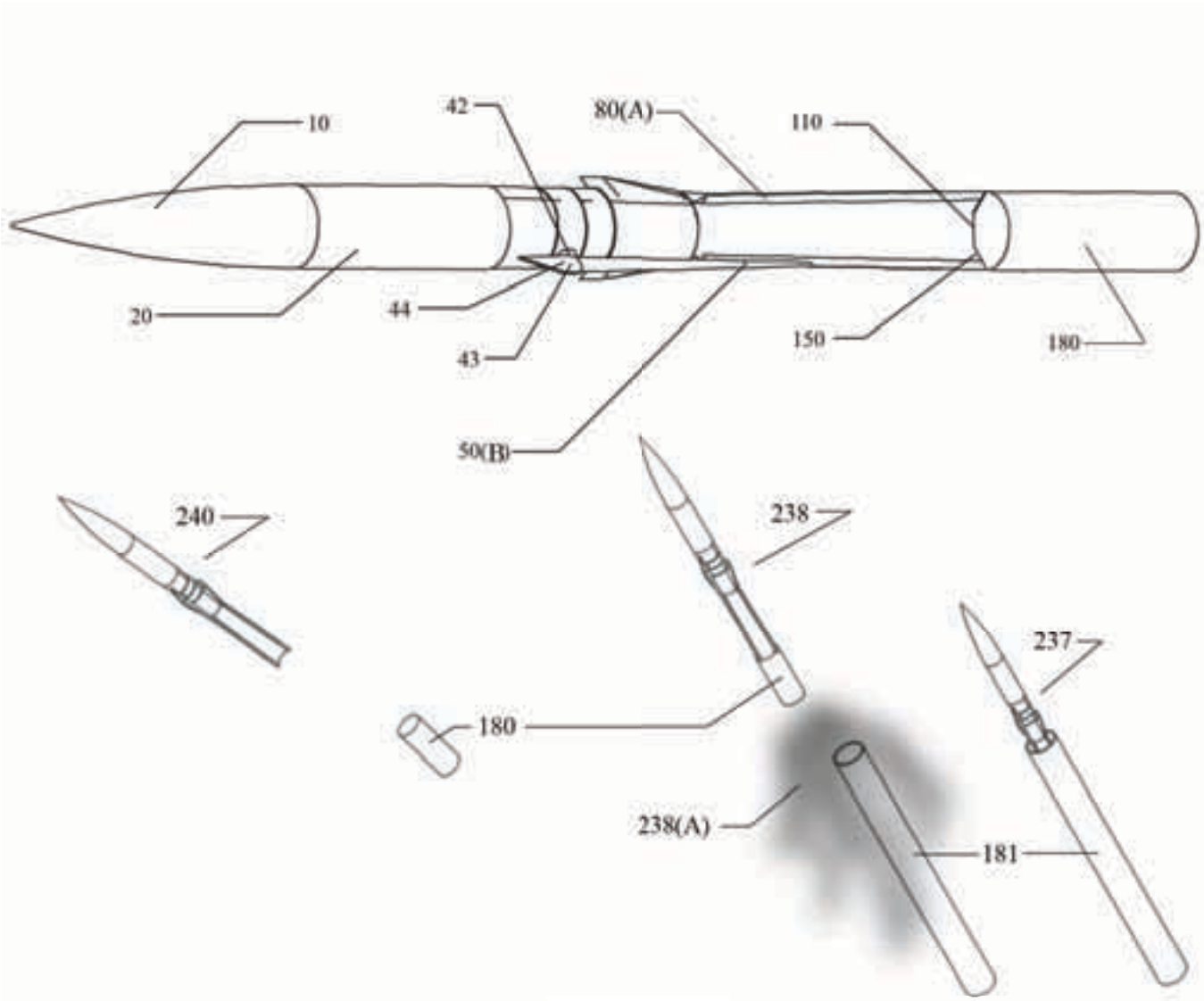


Supersonic Hovering Air Vehicle (SHAV)

Hover Configuration

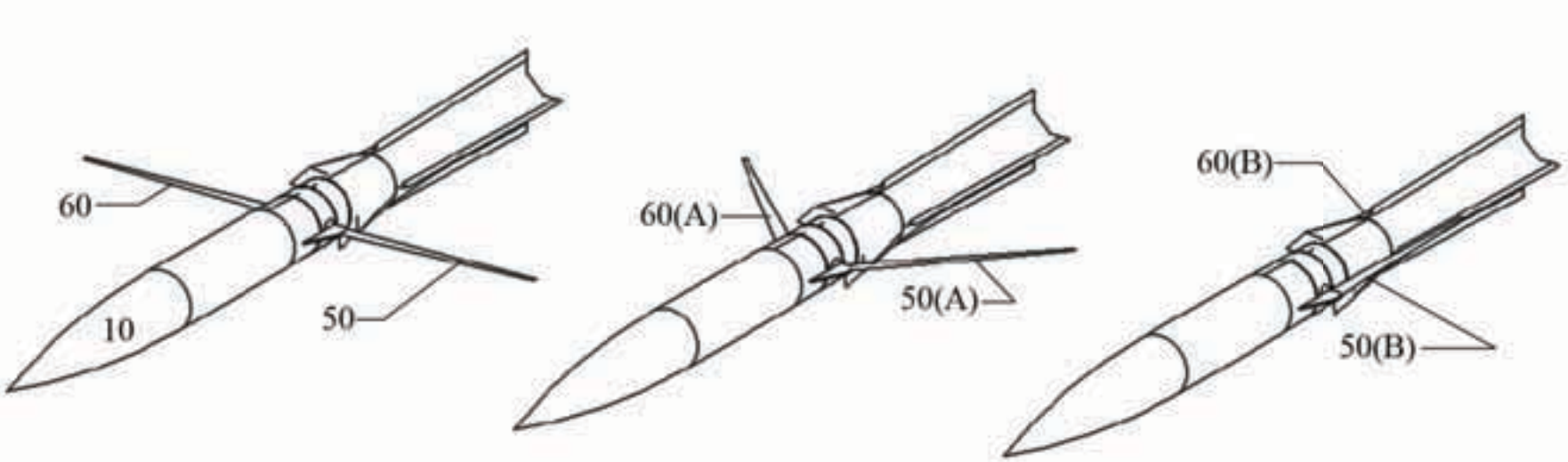


DARPA X-Plane Possibility:



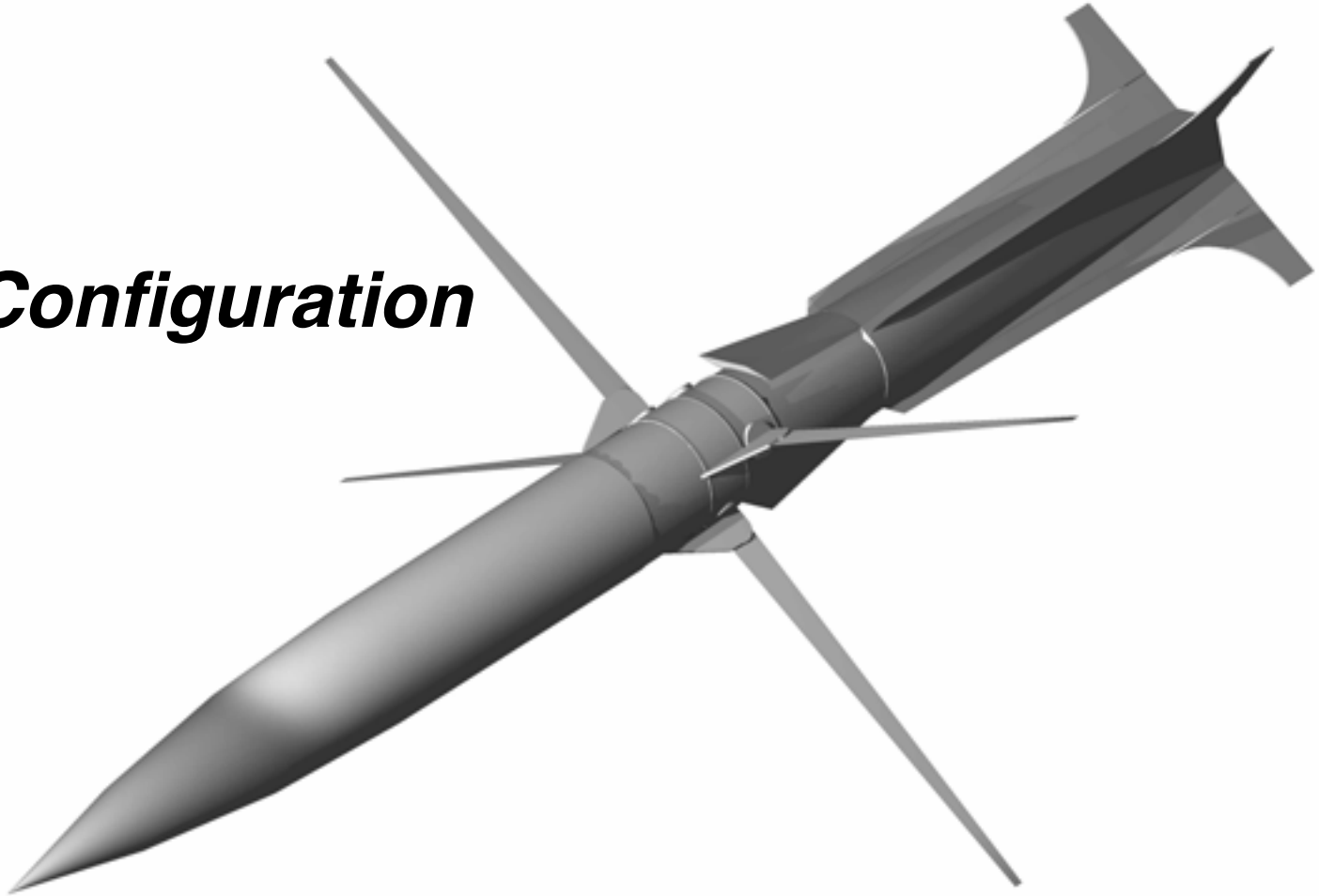
Supersonic Hovering Air Vehicle (SHAV)

Wing Fold Sequence

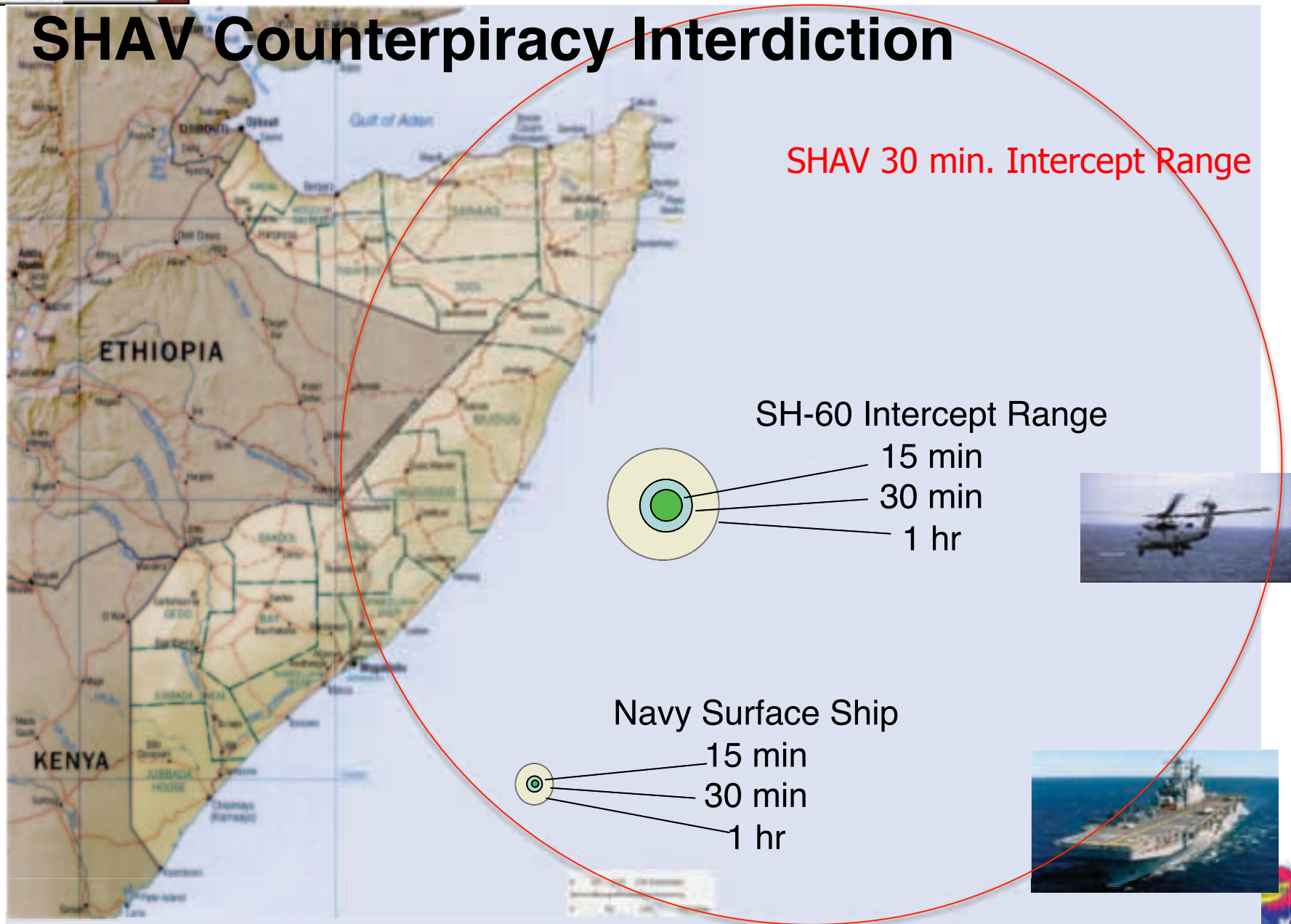


Supersonic Hovering Air Vehicle (SHAV)

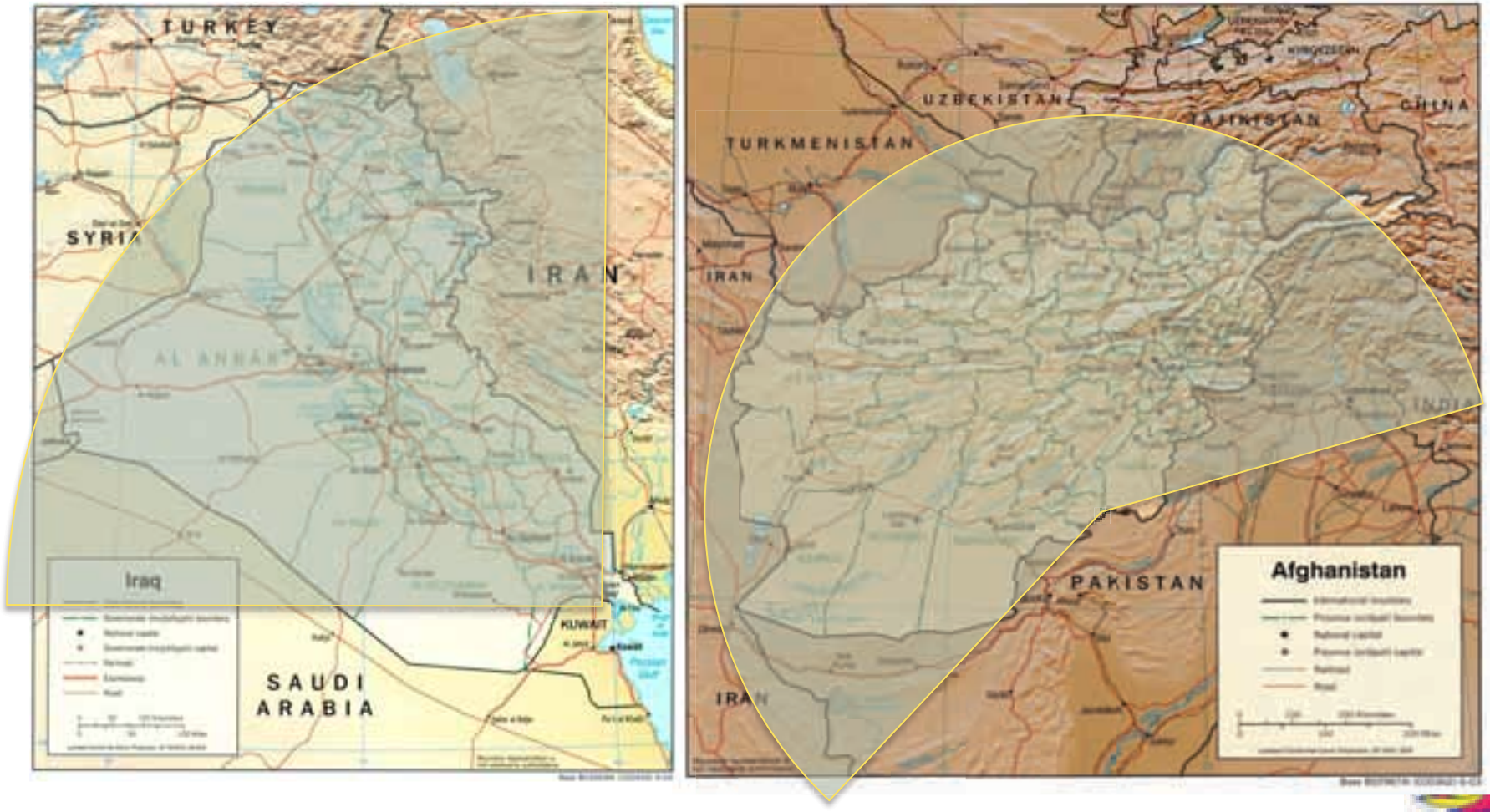
X-Configuration



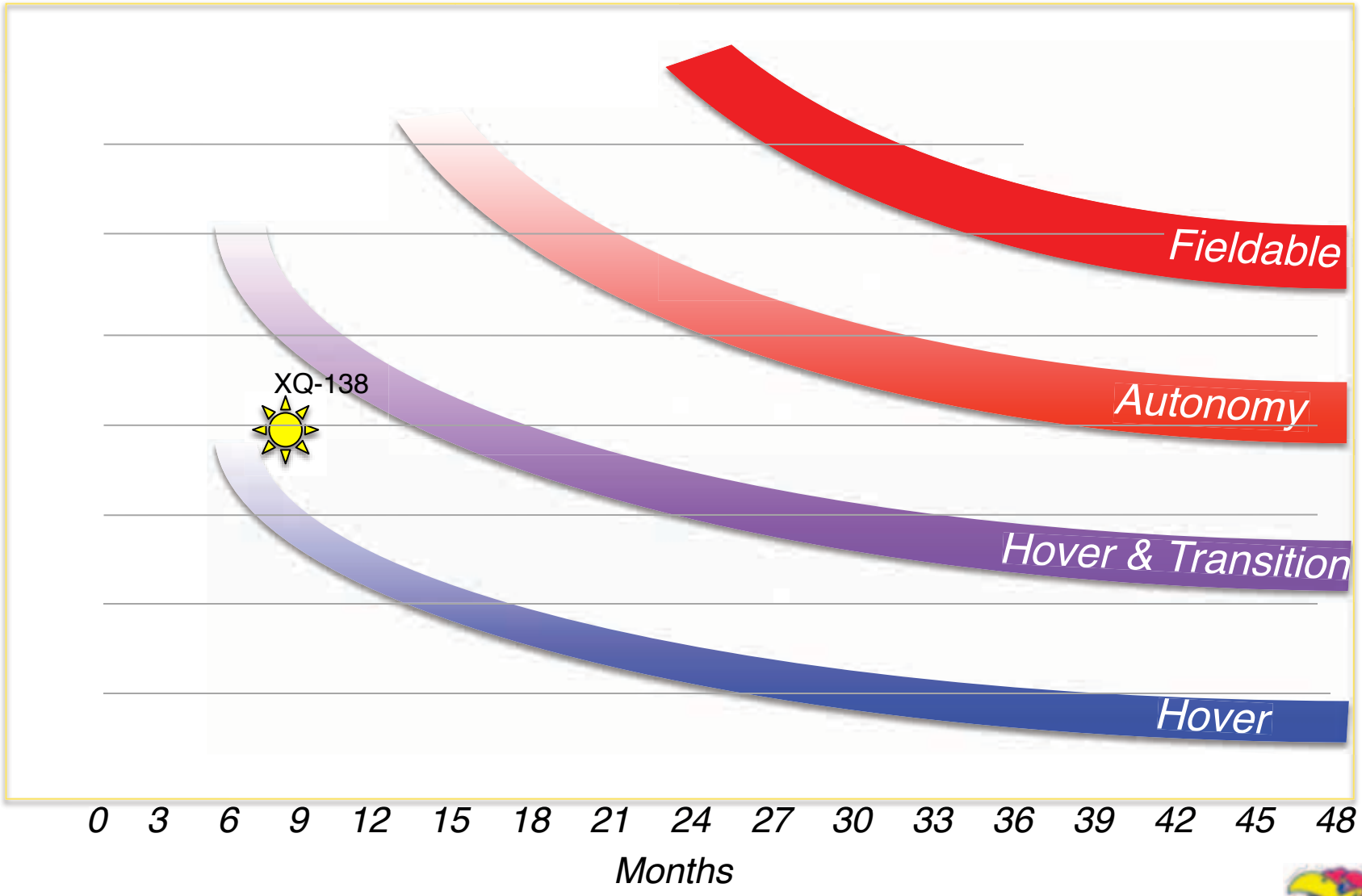
SHAV Counterpiracy Interdiction



Supersonic Hovering Air Vehicle (SHAV)
1000lb MGWTO 5 min. TIC Response



ROM Estimations



Questions??

- Collocated Close Air Support (CCAS)
- PSYOP, force multiplier, perch & rest/stare/listen etc.
- Visual, Acoustic & RF signature suppression
- Hovering Precision Weapon (HPW) & stalking mines
- Counter IED, BDA, lethal/nonlethal counterpiracy
- High Precision Air Rapid (HiPAR) Cargo Delivery System
- ***Supersonic variants...?***