The Next Frontier: UAVs for Great Power Conflict

Autonomous Collaborative Platforms for Long-Range Penetrating Strike

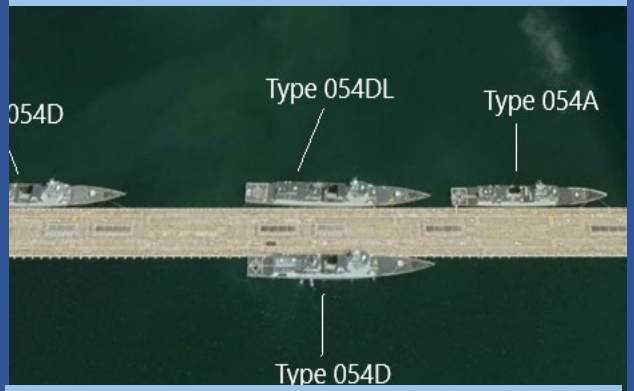
Caitlin Lee and
Mark Gunzinger

clee@afa.org mgunzinger@afa.org

MI workshop examined how ACPs can contribute to long-range penetrating strike operations

MARITIME STRIKE

Strike a PLA Navy surface action group operating 150 nm northeast of Taiwan Strait



Objective:

Achieve catastrophic kill of main surface combatants

TEL HUNT

Strike DF-17 and DF-21 TELs deployed from two garrisons located in SE China

Objective:

Achieve 50% reduction in launch capacity by attacks on TELs and their garrisons

AIRBASE ATTACK

Strike a PLA Air Force H-6 bomber base located in central China

Objective:

Suppress airbase operations for at least 72 hours

Workshop convened operators, scientists and engineers from the Air Force, industry and DOD to focus on how ACPs could contribute to 3 penetrating strike missions (key part of denial campaign) in a highly contested environment during a conflict between the U.S. and China over Taiwan

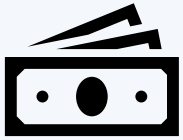
Over three days, teams designed ACP packages, assessed risks and costs, and revised ACP packages to reduce costs

Day 1: Mission Planning and ACP Designs

Operators and engineers broke into 3 teams to:

- Identify an operating concept for their mission and capability gaps in their 2030 baseline force
- Design ACPs to fill the gaps
- Rank order ACP design attributes
- Assess impact of ACPs on operational effectiveness and risk

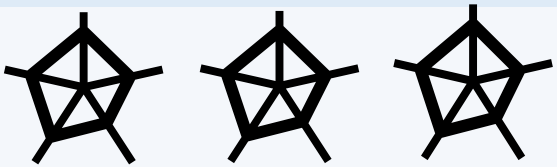
Day 2: Design Feasibility and Cost Assessment



A unified assessment team estimated a ROM cost for each ACP by creating a parametric tool that:

- Calculated ACP required empty weight based on range, payload, and speed (pick 2, trade 1)
- Utilized empty weight to develop rough order of magnitude ACP unit recurring flyaway cost estimates
- Selected multipliers for sensors & payloads based on sophistication (low, medium, high)

Day 3: Tradeoffs

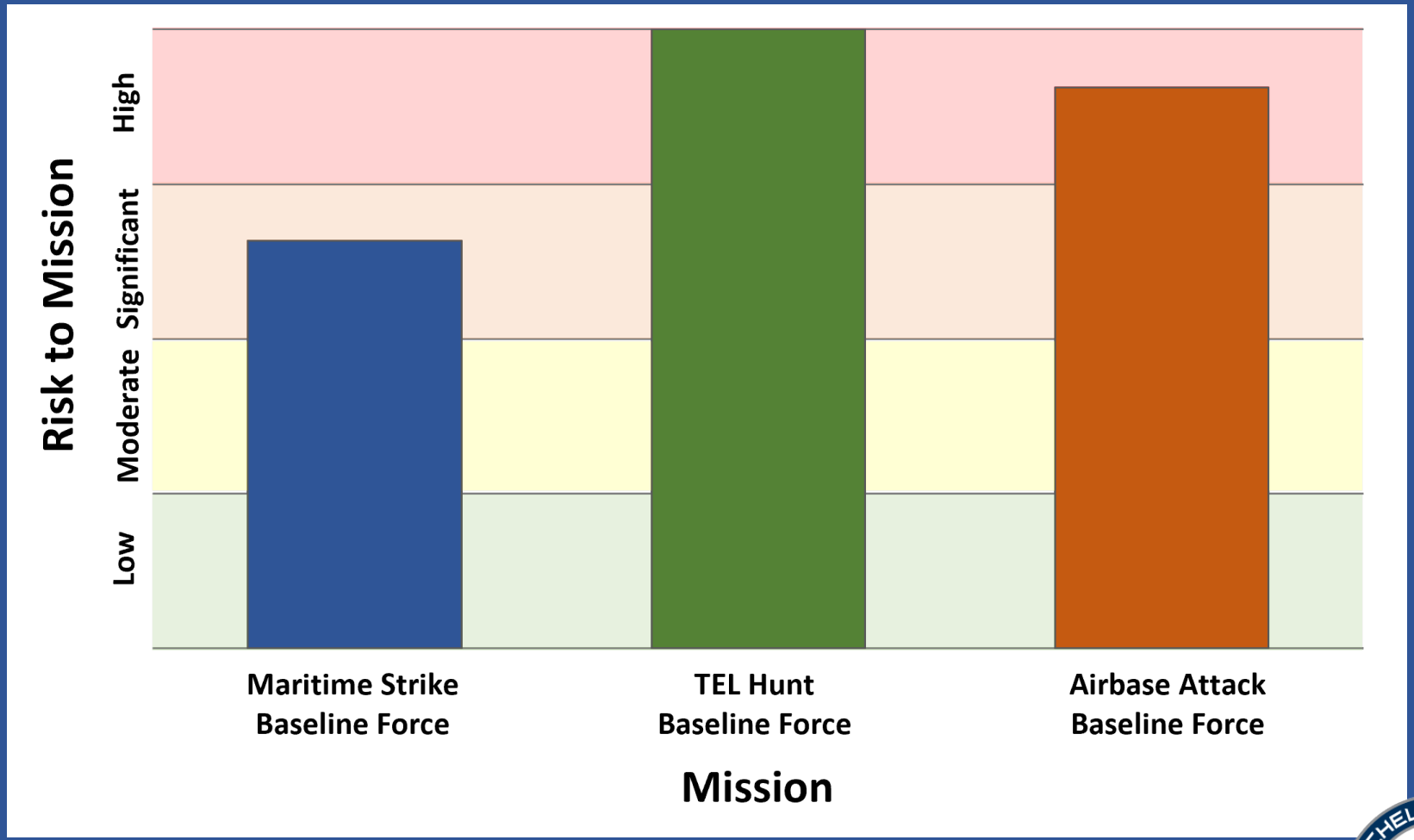


Operators and engineers broke into 3 teams to:

- Rebalance ACP platforms to meet a cost challenge imposed by the white cell
- Discuss level of “regret” regarding attributes lost in tradeoffs
- Re-assess impact of ACPs on operational effectiveness and risk in light of trades

Cost was only used a means to force teams to make changes and tradeoffs to their operational concepts and ACP attributes

Significant to high mission risk for all three baseline forces (no ACP family of systems)



Penetrating strike mission gaps in ISR, C3, Counterair, and EW

		Maritime Strike Baseline Force		TEL Hunt Baseline Force		Airbase Attack Baseline Force	
		Capability Gap	Capacity Shortfall	Capability Gap	Capacity Shortfall	Capability Gap	Capacity Shortfall
ISR to locate and track moving targets							
Command, control, communications							
Counterair	Attack						
	SEAD						
	Escort						
	Defensive counterair						
Electronic attack							

No Gap/Shortfall

Significant Gap/Shortfall

Not Critical for Workshop Vignette

*Gaps are for single force packages; we did not conduct a campaign-level force sufficiency exercise

Finding: Experts preferred smaller, lower-cost systems at scale

Maritime Strike

ACP 1 – Counterair
- **Number: 40, *non-attritable***
- **Flyway: $60.7 million**
- Gross weight: 72,769 lbs
- Survivability: VLO
- Sensor: AESA, IRST
- Weapons: 2 x SiAW, 4 x AMRAAM
- Takeoff/land: Runway < 5,000 ft

ACP 2 – ISR
- **Number: 10, *attritable***
- **Flyway: $4.2 million**
- Gross weight: 72,769 lbs
- Survivability: LO
- Sensor: SAR
- Weapons: n/a
- Takeoff/land: Road, runway <5,000 ft

ACP 3 – Strike
- **Number: 20, *attritable***
- **Flyway: $16.4 million**
- Gross weight: 33,688 lbs
- Survivability: No LO
- Sensor: n/a
- Weapons: 2 x LRASM
- Takeoff/land: Runway <5,000 ft

TEL Hunt

ACP 1 – Counterair
- **Number: 10, *non-attritable***
- **Flyaway: $60.7 million**
- Gross weight: 51,231 lbs
- Survivability: VLO
- Sensor: AESA, IRST
- Weapons: JATM
- Takeoff/land: Road, runway 5,000 ft

ACP 2 – Loitering PGM
- **Number: 144 (24/bomber), *expendable***
- **Flyaway: $1.7 million**
- Gross weight: 2,769 lbs
- Survivability: VLO
- Sensor: Low-cost SAR
- Takeoff/land: B-2, B-21 launched

ACP 3 – Loitering PGM
- **Number: 120/rocket, *expendable***
- **Flyway: $11 million**
- Gross weight: UAVs: 50 lbs/each
- Survivability: No LO (small, low-flying)
- Sensor: Low-cost long wave IR
- Takeoff/land: B-52 launched

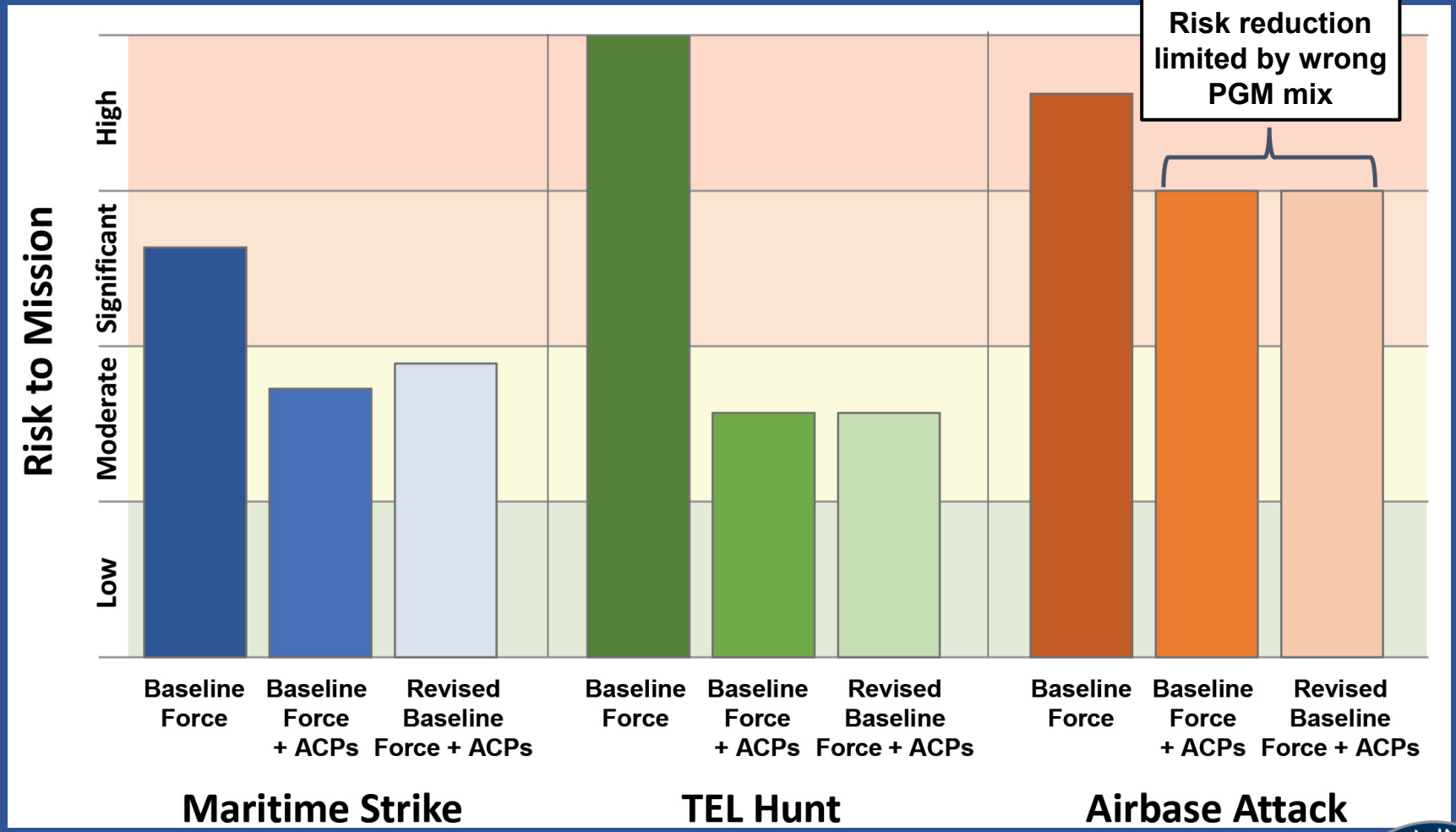
Airbase Attack

ACP 3 – Counterair
- **Number: 8, *attritable***
- **Flyway: $28.2 million**
- Gross weight: 16,500 lbs
- Survivability: VLO
- Sensor: AESA, IRST
- Weapons:6 x AMRAAM
- Takeoff/land: Runway < 5,000 ft

ACP 2 – Counterair
- **Number: 16, *attritable***
- **Flyway: $29 million**
- Gross weight: 27,000 lbs
- Survivability: VLO
- Sensor: SAR
- Weapons: 6 x SiAW
- Takeoff/land: Runway <5,000 ft

ACP 3 – EA
- **Number: 8, *attritable***
- **Flyway: $8.9 million**
- Gross weight: 7,000 lbs
- Survivability: VLO
- Sensor: EW pod
- Weapons: n/a
- Takeoff/land: Runway <5,000 ft

Finding: ACPs significantly reduced risk to mission



Finding: High degree of autonomy preferred, but maturity, policy and cost issues need further definition

Maritime Strike Autonomy

ACP 1 (Counterair): Collaborative (5B)

ACP 2 (ISR): Collaborative (5B)

ACP 3 (Strike): Platform resiliency (4)

TEL Hunt Autonomy

ACP 1 (Counterair): Platform resiliency (4)

ACP 2 (Loitering PGM): Individual (5A)

ACP 3 (Loitering PGM): Collaborative (5B)

Airbase Attack Autonomy

ACP 1 (Counterair): Collaborative (5B)

ACP 2 (Counterair): Collaborative (5B)

ACP 3 (EA): Collaborative (5B)

Opportunity	Challenge
• Experts saw "untethered autonomy" (level 4 or higher) as providing a major operational advantage in a contested air environment	• Experts not confident desired AI is available • Policy concerns • No consensus on AI costing b/c of lack of cost data • Unclear what bridge from tethered to untethered looks like

"Untethered" Autonomy Menu

4. Platform Resiliency – If ACP loses data link to human operator and access to GPS, it can still perform its mission with limited set of trusted onboard behavior and employment of alternative position, navigation and timing methods

5. Platform autonomy – Platform can intentionally be cut loose from human control to execute a given set of plays, i.e., "go look for SA-21; don't go further than 500 nm, and report back." Capable of understanding ROE.

A. **Individual autonomy:** single ACP operates independently of human operator

B. **Collaborative autonomy:** Multiple uncrewed platforms operate independently of operator, but communicate with each other via a datalink to achieve a pre-determined goal

Other Findings: To manage ACP risk, several "big rocks" should be addressed

Big Rock	Opportunities	Challenges
Cost	New approaches could lead to lower dollars per lb ($1,000/lb) • Design (smaller aircraft, lower air worthiness) • Manufacturing (composites) • Maintenance (manpower)	Legacy aircraft cost $4,000–$8,000/lb Current cost models use this legacy aircraft data
Sophisticated capabilities	Commercial SAR, low-cost AESA, IRST, etc.	ACP may need LO/VLO, sophisticated sensors and weapons, to operate with inhabited aircraft in highly contested environments
Disaggregation of capabilities	Complicates adversary targeting, forces adversary to expend rounds, and reduce costs	Disaggregating capabilities places even higher demand on robust communications
Runway alternatives	Complicates adversary targeting and reduce costs	Greatly complicates logistics and sustainment
Production capacity	Open architecture/modularity could increase innovation and competition for software development Simpler ACP designs could increase competition and bring on more ACP vendors	Intellectual property issues Production vs. sustainment contracts

Recommendations

1. Release an Air Force Flight Plan that links ACP development to the National Defense Strategy

2. Launch an Air Force ACP operational experimentation campaign

3. Require ACP modularity to enable continuous cycle of learning, development, and production

4. Prioritize fielding ACPs with modest capabilities in large numbers; initial fleet should include ACPs for counterair missions

Recommendations

5. Complement ongoing analysis with unclassified workshops and wargames to refine and demonstrate ACP technologies

6. Determine appropriate cost assessment methods for ACPs

7. Develop new munitions to maximize penetrating strike cost-effectiveness

8. Work with lawmakers and DOD to increase Air Force funding for a future force design that combines sufficient numbers of next-generation manned aircraft with ACPs capable of collaborative combat operations

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