

MITCHELL INSTITUTE
for Aerospace Studies



Thinking about Cost-Effectiveness Analysis

Mark Gunzinger

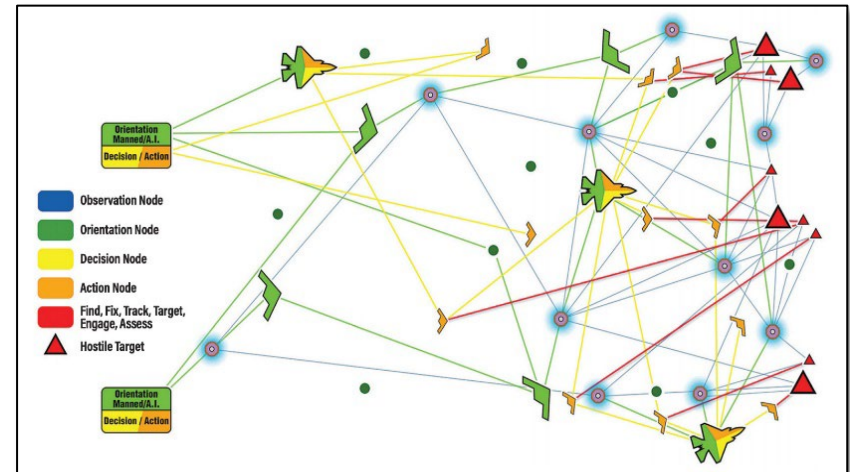
**Director of Future Concepts and
Capability Assessments**



Describing cost-effectiveness analysis

Compares the costs and potential effects created by different capabilities for the purpose of maximizing the value of desired outcomes

- Considers the total cost involved with achieving specific mission outcomes
- For air operations, this can include the cost of aircraft, their mission systems, and weapons they expend to execute tasks such as striking targets
- It can also include costs of other direct support assets such as aerial refueling tankers, electronic jamming platforms, surface-to-air missile suppression efforts, aircrews, and support equipment required to achieve the task





Cost-effectiveness analysis can help inform DOD's modernization choices

DOD has a growing strategy-resource mismatch: There is a gap between the capabilities and capacity of our military and the challenges it must prepare for

- Unprecedented array of threats to the U.S. homeland, multi-polar strategic competition, mid-tier adversaries, non-state actors with access to asymmetric weapons...
- Delayed modernization has created budget “bow waves” that cannot be further deferred
- Reality of flat or declining defense budgets

Additional DAF challenges

- Now funding 2 services without significant budget growth
- Budget “pass-through” masking the Air Force’s smallest share of the defense budget

Reducing this gap requires force design and acquisition decisions that maximize combat effectiveness

- Budget-driven factors such as unit cost & cost per operating hour tend to dominate debates over future force design and modernization investments
- Focusing on these costs absent consideration of mission effectiveness drives procurement of capabilities that may have less operational capability and capacity



Example: USAF fighter force design

Table from a 2019 OSD/CAPE presentation supporting F-15EX acquisition

Aircraft	Ave APUC ⁶ (FY20\$M)	Service Life (Hours)	2020-2035 Ave CPFH (FY20\$K)	Total Cost of Ownership per Hour (FY20\$K) ²
F-35A	\$100	8,000	\$44	\$56
F-35B	\$120	2,100 ³ / 8,000	\$44	\$101 / \$59
F-35C	\$110	8,000	\$44	\$58
F-15EX	\$90	20,000 ⁴	\$29	\$34
F/A-18E/F	\$80 ⁵	9,000	\$23	\$30

Table is UNCLASSIFIED

² Total Cost of Ownership per Hour = (APUC + Service Life) + CPFH

³ F-35B current certified service life is 2,100 hours⁷ structural fatigue test to increase service life to 8,000 hours TBD

⁴ Boeing estimate

⁵ Multi-year procurement pricing for 24 F/A-18E/F Block III aircraft

⁶ Excludes initial spares

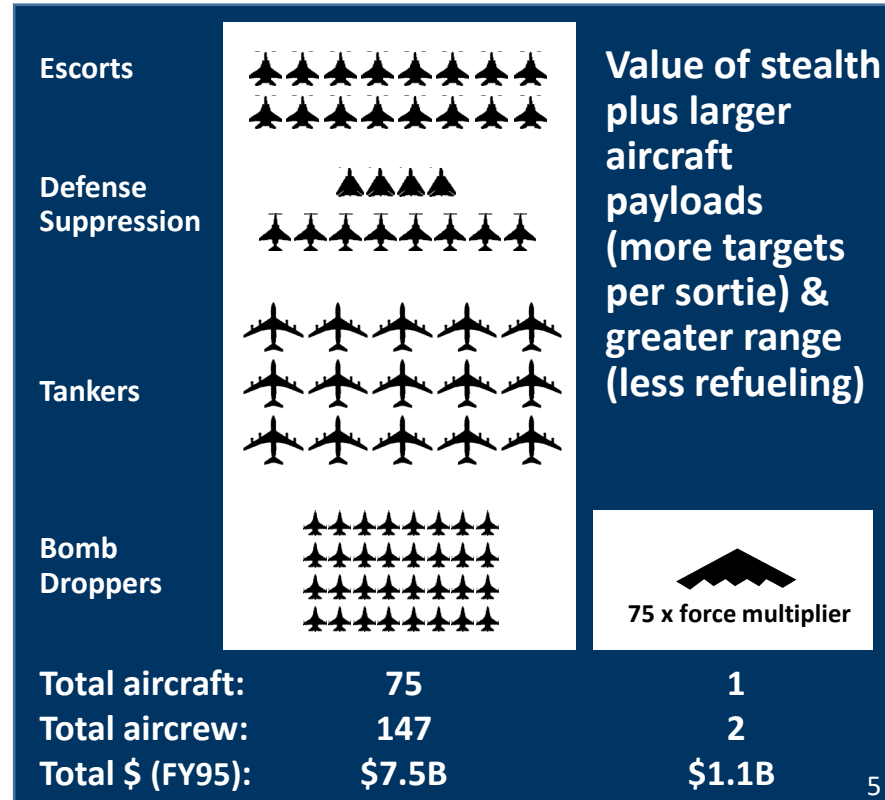
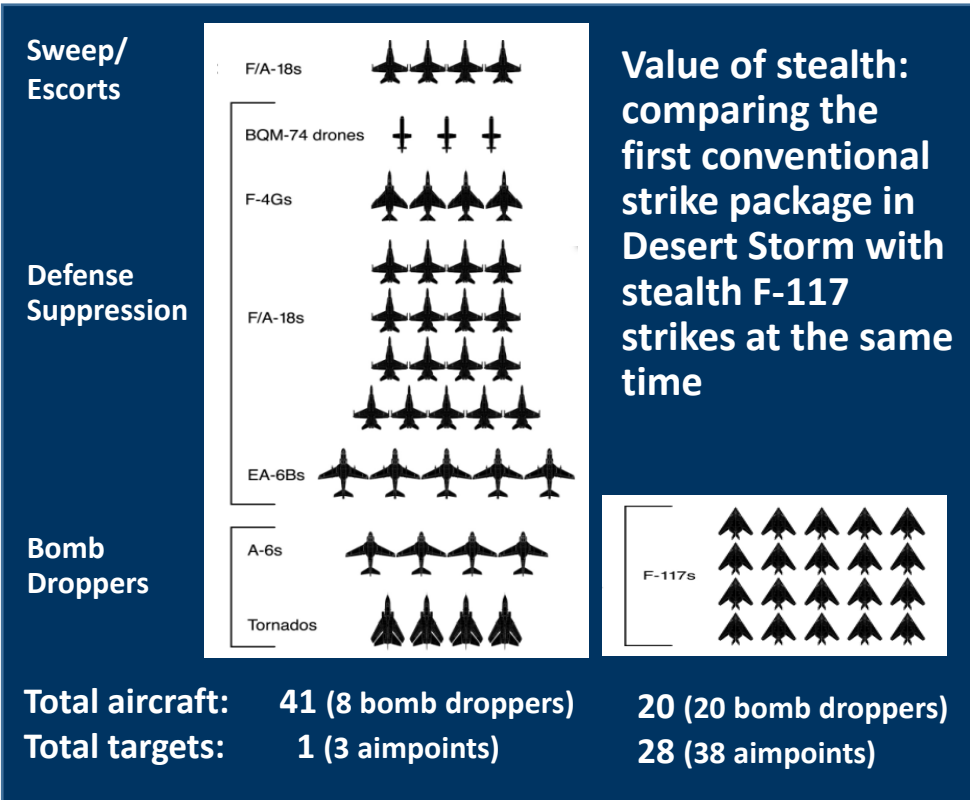
**Breaking news:
will be \$35k by
2023 (in FY20\$)**

- **This narrow, budget-driven analytical focus fails to fully value the operational advantages of 5th gen aircraft**
- **Future force mix analyses should also consider:**
 - Cost of larger mission packages needed to support 4th gen fighter operations
 - Higher 4th gen fighter attrition rates and pilot losses in combat
 - Increased potential for mission failures



Must consider cost to achieve specific effects, not just acquisition and CPFH

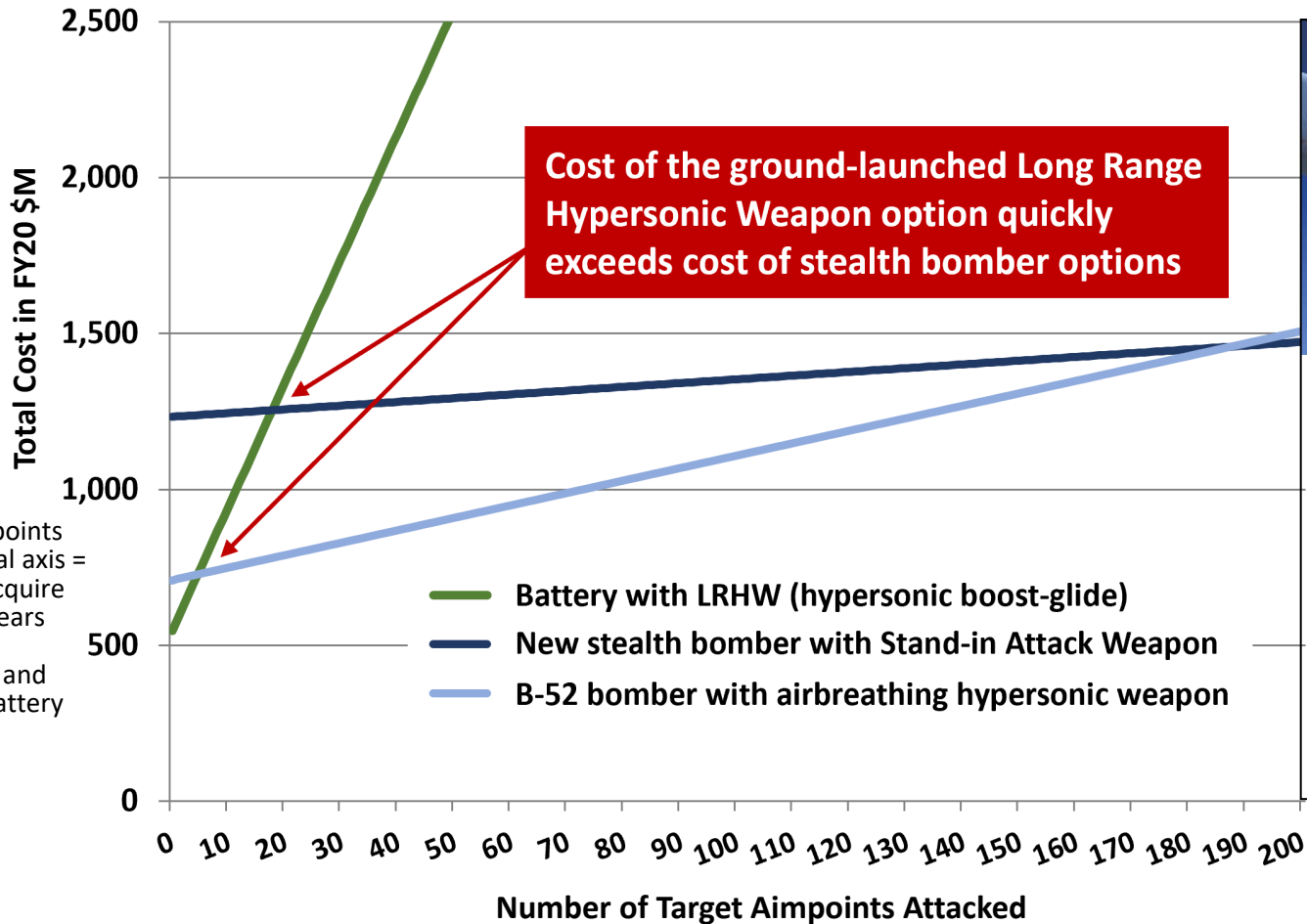
- Cost of kinetic and non-kinetic effectors
- Survivability of aircraft and their weapons; the Air Force cannot absorb high attrition rates with a force that is now too small for a *single* peer conflict
- Aircraft range and payload capacity have an impact
- Ability to complete kill chains in contested areas with reduced external support





Cost-effectiveness analyses should consider cross-service options to achieve desired mission effects

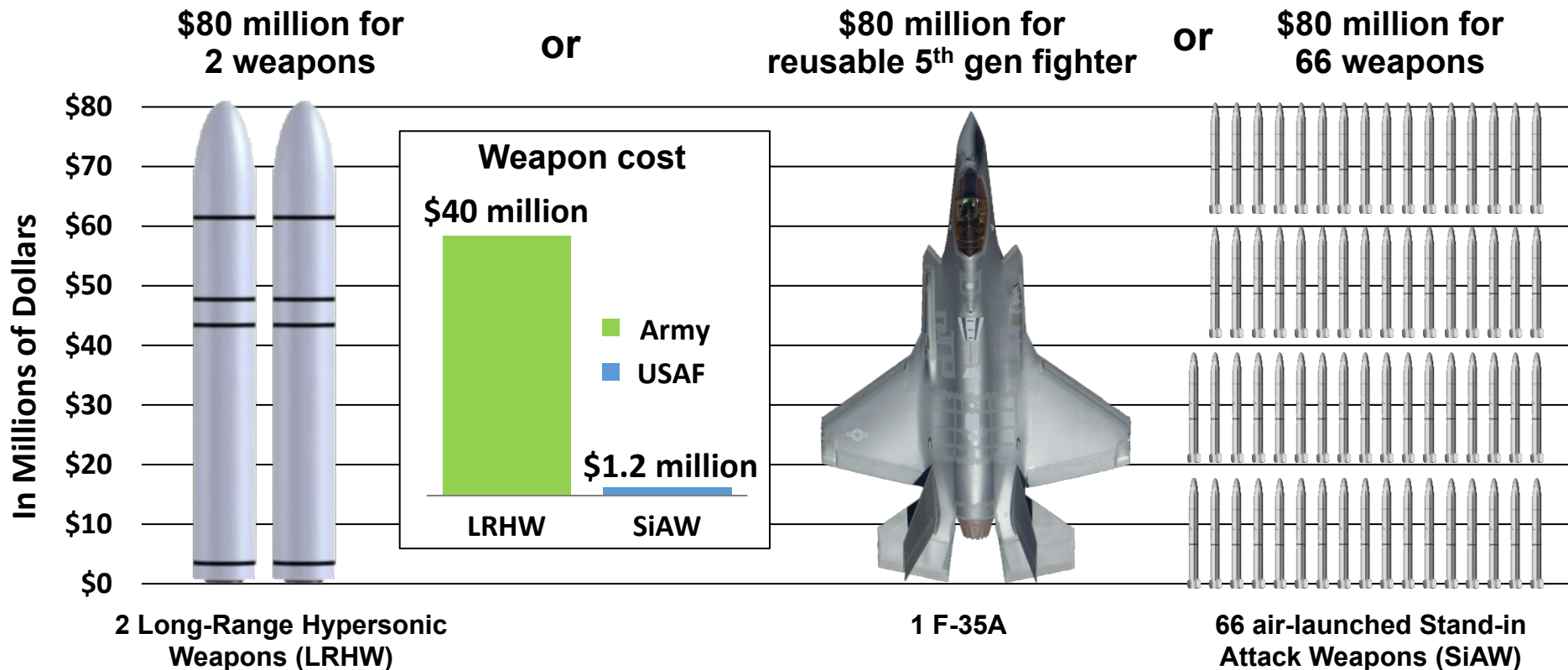
Example includes costs to acquire a missile battery, a notional stealth bomber, 30-year O&S for all three platforms, and the weapons they expend





Thoughts on implementing

- Include in USAF future force design planning — assess mission effects
- Adopt as part of JCIDS process evaluating potential new capabilities
- Create cost-per-effect Key Performance Parameters for new acquisition programs
- OMB, GAO, and others update their assessment methodology





www.mitchellaerospacepower.org