Winning the Battle of the Airfields

Seventy Years of RAND Analysis on Air Base Defense and Attack

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Air base defense and attack (ABD/A) has been the subject of sustained research and analysis at the RAND Corporation for most of its history. This report provides an overview of RAND's work in this area from 1951 through 2020, describes RAND's contributions (both in substance and analytical methods), and identifies enduring insights for improving the resiliency of U.S. air bases in the face of modern threats.

APPROACH

This research approach leaned heavily on RAND's library and archival resources. The authors used RAND's online databases and print indexes to compile an initial list of reports related to ABD/A; after collecting a critical mass, they were able to find even more reports by mining the bibliographies of the initial set. This method of snowball sampling resulted in a bibliography of 264 reports that is very nearly comprehensive and includes both classified and unclassified work. For the analysis of RAND publications, the authors included all 264 reports, but for the broader discussion of RAND work over the decades, they focused only on the subset of unclassified reports.

CONCLUSIONS

- RAND has made far-reaching contributions to the resiliency of U.S. air power, and sometimes led the way:
  - Over seven decades, RAND analysis has responded to an ever-evolving geopolitical, military, and technological landscape in step with its DoD and USAF sponsors, but, given RAND's charter, it was not entirely bound by them.
  - At critical junctures, RAND led its DoD and USAF sponsors, identifying emerging threats to air bases and potential solutions well before the broader community acknowledged them.
  - RAND's greatest contributions were in its disciplined and creative application of more formal analytical tools to the problem of ABD/A. RAND researchers invented and applied these tools so that the relative utility of various offensive and defensive concepts could be measured systematically.
- RAND analysis of ABD/A offers several enduring insights:
  - Air bases have always been, and are likely to remain, priority targets in wars. This is true because air power is an element that must be countered to prevail in conflict, and air bases are specific points of vulnerability.
  - Air base attackers will rarely limit themselves to a single attack mode.

- There are no simple or cheap means to defend air bases.

- Aircraft dispersal on and across bases has renewed salience for air base defense. Distributed operations present a host of challenges but are often easier to implement than other passive defense options and do not require massive investments in infrastructure at bases that may not be needed in the next war.

- ABD/A is best understood from a systems perspective.

- "The Battle of the Airfields" will likely look quite different in the coming decades, but if history is any guide, RAND will continue to be actively involved in supporting USAF and DoD efforts to ensure the resiliency of American air power—whether that air power comprises mobile missiles, unmanned aircraft launched from trucks, or manned aircraft flying from more traditional air bases.

HIGHLIGHTED RAND CONTRIBUTIONS TO AIR BASE DEFENSE AND ATTACK OVER 70 YEARS

Time Period	Highlighted RAND Contributions to ABD/A
1950–1959 Nuclear Threats to USAF Bases in the United States and Europe	• Foundations of deterrence theory • Systems analysis of bomber basing • Comprehensive analysis of vulnerability of tactical air bases in NATO • Analysis of potential contributions of SAMs to air base air defense • Analysis of aircraft and missile vulnerability during flyout • Cost-effectiveness analysis of hardened aircraft shelters
1960–1969 A Shift Toward Conventional and Offensive Operations	• Engineering analysis of hardened aircraft shelter designs • Analysis of runway attack tactics and weapons choices • Viability of conventionally armed IRBMs in air base attack • Application of Vietnam lessons learned to air base ground defense in Thailand
1970–1989 Conventional Warfare in Central Europe	• Explored complex dynamics and trade-offs of ABD/A scenarios using nascent modeling and simulation techniques • Assessed novel concepts for the use of remotely piloted vehicles • Recommended dispersing resources from main operating bases and designing future aircraft to be forward-deployable
1990–2009 Era of Rear Area Sanctuary for USAF	• Analysis of air base ground attack as an adversary asymmetric strategy • Comprehensive history of ground attacks on air bases • Detailed analysis of GPS-guided missile threat to USAF bases • Integration of missile attacks on air bases in a campaign-level model
2010–2020 Anti-Access Threat to U.S. Bases Reinvigorates Analysis of Air Base Defense	• Major advances in analytical methods for assessing conduct of operations in contested, degraded, and operationally limited environments • Comprehensive open-source assessment of the U.S.-China military balance, including relative ABD/A capabilities • Lessons learned from air base attacks during 26 conflicts • Assessment of force presentation implications of distribution air operations • Analysis of implications of adaptive basing concepts for Agile Combat Support

NOTE: Contribution can be from a single report or multiple reports.