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TECHNICAL REPORT

# Expendable Missiles vs. Reusable Platform Costs and Historical Data

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*Thomas Hamilton*

Prepared for the United States Air Force  
Approved for public release; distribution unlimited



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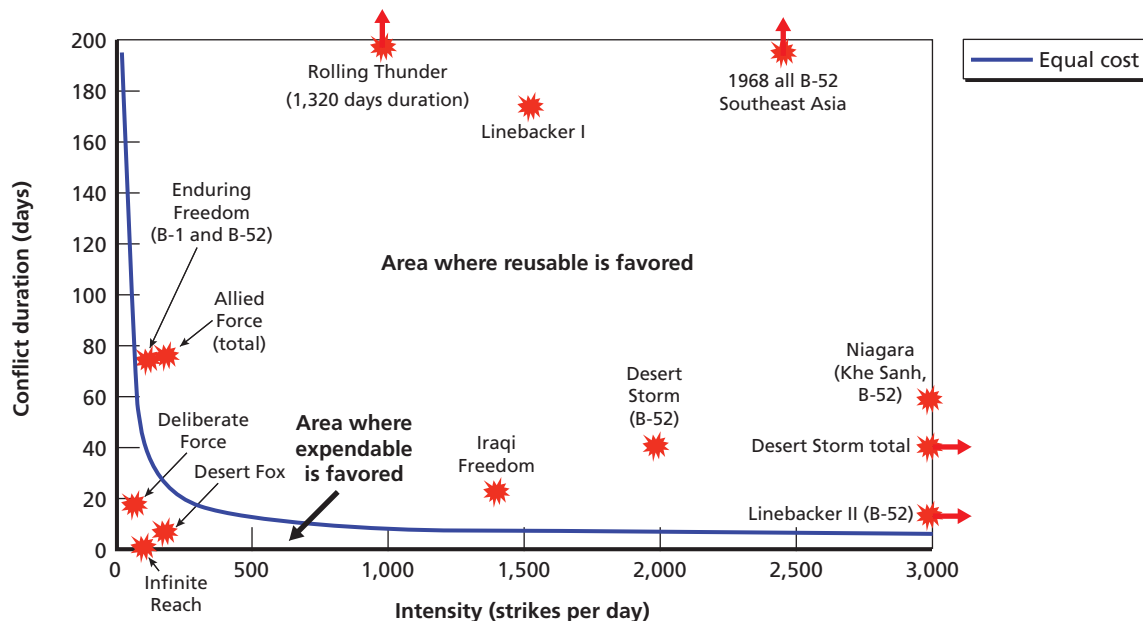
## Summary

The purpose of this report is to evaluate the economic wisdom of the United States adopting policies that rely primarily on expendable weapons, such as cruise missiles, to conduct air-to-ground strike missions. We examine the historical use of air-to-ground attack by the U.S. military during and since the Vietnam War and examine when exclusive use of expendable methods would be cost-prohibitive compared to using reusable weapon platforms. This analysis focuses solely on cost and does not explore the range of capabilities of the different weapon systems. Thus, conclusions do not address strategies involving a mix of reusable penetrating aircraft and expendable munitions.

We analyzed campaigns in terms of two parameters: the average intensity of the conflict in average weapons delivered per day and the duration of the conflict in days.

Figure S.1 summarizes both the historical data and our simple model for the sum of development and procurement costs. The blue line is the cost indifference curve between conducting the campaign with long-range cruise missiles and conducting it with a new, 20,000-lb-payload reusable aircraft. The line goes up sharply on the left side of the table, which corresponds to relatively small campaigns. If the United States only has to prepare for small campaigns, the

**Figure S.1**  
**Reusable Versus Expendable Costs and Historical Conflicts**



RAND TR1230-S.1

development cost of a reusable platform is an unnecessary expense. A few missiles will suffice. On the right side of the chart, the indifference curve becomes flat. Whether exclusive reliance on expendable platforms is cost-prohibitive depends entirely on the length of the conflict. This reflects the fundamental fact that there is no point in buying a reusable platform if you are not going to reuse it. The conflict duration at which exclusive reliance on expendable platforms becomes prohibitive depends on a number of assumptions about the cost, availability, and utilization rates of weapon systems, but for any realistic possibilities, expendable platforms become costly for conflicts persisting on the order of ten days. Appendix A describes our baseline cost assumptions. Appendix C describes several alternative cost assumptions.

Note that each of the major conflicts in recent history depicted in Figure S.1 has lasted longer than ten days. This analysis assumes that a reusable platform will be designed, purchased, and used in only one conflict. In reality, U.S. planning should be based on the total number of days of conflict for which the United States needs to be prepared over the lifetime of a proposed reusable platform. Only if the United States is confident that all possible conflicts over the system lifetime can be ended in a total of less than about ten days is exclusive reliance on expendable assets prudent.

This conclusion does not imply that expendable assets are not an important part of a well-designed force mix. There are important operational advantages to having at least some expendable weapons that this report does not address.

However, if the United States wishes to maintain the capability to wage air war efficiently for more than a few days, reusable platforms are an important part of an efficient force mix. This implies that, if the United States has a requirement for a substantial long-range strike capability and if the existing bomber fleet will for some reason, such as age or survivability, not be able to meet that requirement in the future, the nation should take steps to have appropriate weapon systems available when needed. Defining appropriate weapon systems requires analysis of alternative strategies relying on mixes of currently available expendable and reusable platforms and/or new weapon systems.