PROJECT AIR FORCE

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Preserving Range and Airspace Access for the Air Force Mission

Striving for a Strategic Vantage Point

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RAND PROJECT AIR FORCE

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Summary

The Air Force relies on access to flight ranges and their associated airspace for a variety of critical training and testing activities. Specific range activities include test and evaluation of new weapon systems and aircraft; formal training, which enables aircrews to receive foundational instruction and hands-on experience; and continuation training, which refines the skills necessary to achieve levels of combat capability needed for overseas contingency deployments and a range of warfighting challenges.

In upholding access rights, range managers and other stakeholders (including the Air Force and FAA) need to know what the requirements are for an activity and how it relates to joint missions and national security objectives. This key information becomes more critical to smooth test and training flight operations as various range managers and mission stakeholders (such as the military liaison at the FAA) set priorities among multiple military and civilian users for specific areas. Making these requirements more visible during planning, scheduling, and long-term resource decisionmaking processes will, in turn, help maintain access by enabling managers at all levels to make decisions that are more precise and effective. Developing a full understanding of the *intended* use of range infrastructure by creating a common body of knowledge about prior and planned unit activities would improve the analytical basis for test, training, and operational decisions. Better use of this knowledge should help adapt range infrastructures to meet an objective requirement instead of forcing units to adapt to range capabilities.[1]

Even as the FAA is overhauling the National Airspace System, working to make airspace allocation more dynamic and agile, communities and commercial concerns continue to spread into land previously considered remote, further complicating the access problem. The Air Force must be able to determine its actual requirements confidently and to convey its confidence to other stakeholders. Positive results will also require incentives for such landowners as the Bureau of Land Management, the U.S. Forest Service, and surrounding communities to encourage them to preserve the qualities Air Force units value, thus keeping the areas suitable and available for future access. In the midst of this, however, the main objective should be precise and efficient range use. Achieving this is partly about management strategies stressing efficiency, for which range access is the desired outcome. But this quest for efficiency must be tempered by well-informed decisionmaking.

The FAA's approach to airspace allocation is becoming more dynamic and more agile, making a full complement of information about the desired outcomes of test and training

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[1] The approach referred to here requires not just having a common data structure for the information about requirements but also structuring how users and managers interact and the timing.

activities essential. A decision space incorporating that information will also help the Air Force link range activities to selected joint missions and national security priorities. The paramount objectives must be both making efficient use of ranges and being able to demonstrate prudent and fiscally responsible management of the range resource.

Background: The Need to Improve Range Management Capabilities

In recent years, Air Force demand for range assets has grown and changed dramatically. The ongoing wars in Iraq and Afghanistan have increased the demand for specialized training, often scheduled on short notice. At the same time, resource constraints in the defense budget and the threat of civilian encroachment have complicated the range management.

These changes present challenges to prudent and effective range leadership. Over the long term, these challenges will require an investment strategy for ranges that (1) provides sufficient lead time to support evolving training and testing needs, (2) meets the need to explicitly connect that investment strategy to joint mission and national security requirements, and (3) supports an approach to sustaining desired range capabilities. The present difference in perspective may be magnified by the lack of a common framework for making decisions about range use and resource allocation.

This situation requires managers at all levels to possess a depth of information about range demands, usage, and user expectations that does not currently exist. Range management processes and the supporting information infrastructure have not kept pace with evolving training demands. Range management has essentially not changed since the ranges were created after World War II. The local, wing-level range manager has the primary responsibility for decisions about range configuration, operating tempo, and investment needs but often lacks information about the training needs of users, especially those based elsewhere. In this environment, decisionmakers and managers often cannot obtain detailed information on training requirements from range users.

Currently, training requirements flow to the range community from external sources, generally the major commands (MAJCOMs). From the range's viewpoint, knowledge about these training requirements is created when a unit schedules range use and adjusts its expectations to the areas to which it has actually gained access. However, the bulk of unit expectations are not explicit or captured for archiving. At this stage, the "requirement" merely expresses the need for access to a reasonably sized and equipped range area.[2] Even when the unit itself operates the area in question, knowledge is rarely all inclusive at this point. This lack of information makes prudent operations and investment decisions very difficult.[3]

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[2]   Range area, used in this sense, could be a maneuver area, a low-level training route, an air refueling track, or even an air mobility drop zone.

[3]   Our research found that many units with low range priorities scheduled large areas, then used local procedures or agreements with range managers to reconfigure the airspace to meet their needs, sometimes subdividing the area into smaller areas or the time available for multiple flights. While there is nothing technically wrong with this practice, the apparent demand masks the actual use from the range manager. Over time, this interferes with the manager's ability to develop range structures and capabilities that better meet the unit's actual requirements. The unit is merely adapting its activities to the resources it can secure. Discussions with 46 Test Wing, 98 Range Wing, 1 Special Operations Wing, and USAF Weapons School personnel, November 2007–July 2009.

It is also becoming imperative for the service to justify its range use more deliberately. Ranges are under pressure not just because of scarce funding but also because external entities are seeking greater access to the land and airspace the ranges occupy. These pressures can constrain the types of activities conducted at the range or lead to the return of associated land and airspace to other uses, such as more-direct routing of commercial airline traffic.

Objectives and Methods

To address these issues, RAND Project Air Force identified and developed information Air Force managers need to manage and utilize ranges and airspace more effectively and efficiently. In particular, the RAND team updated the Air Force's understanding of the evolving environment for ranges and special-use airspace. This included the changing demand on ranges (both Air Force and other range providers), resource constraints, and other factors identified in a review of the management challenges growing out of this evolving environment. We paid particular attention to the information and data required to address these challenges. We then reviewed processes and developed a strategy for incorporating needed information and data into a common relational database for Air Force ranges.[4]

For this research, we gathered quantitative and qualitative information about how ranges are being used in test and training activities from ACC, AMC, AFSOC, and AETC training documentation, program managers, the USAF Weapons School instructors, and other selected units. We also updated an existing RAND Decision Support Tool and populated it with data on tactics training.

The Air Force's Center Scheduling Enterprise (CSE) is a web-based scheduling program and relational database. RAND's decision support tool is intended to be part of a broader information system that would improve daily scheduling transactions on range complexes and support improved range management decisions and enterprise investment. In 2001, we created a relational database with range requirements and related information that uses an illustrative interface for managers' queries. We further pointed out the necessity of a web-based system to organize information on range capabilities, capacity, and use. The Air Force is using such an approach for CSE, creating a broader information system that can feed into such analytic tools as RAND's, which require it for currency and proper operation.

Working partly with information from this broader environment, the RAND Decision Tool and other analytic tools could then use archived data from the CSE program about range use to support range management decisions and defend the need for continued access to ranges and airspace. Thus, the tool requires a broader information-gathering system for collecting, organizing, and archiving data about ranges and range use. While portions of the RAND tool were updated and expanded, it is not yet completely integrated with the broader information system it requires to remain current. There is also no process for regularly updating information developed specifically for the RAND tool. RAND put a great deal of effort into updating

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[4]   In parallel with the research effort and with initial funding from the U.S. Joint Forces Command, the Air Force began development of a relational database program to use for range and airspace scheduling. To work better with the training community, the program needed information and data sets RAND initially developed for Air Combat Command (ACC) in 2001. The intention was in better integrate both the scheduling program and the RAND databases. However, this was not possible due to Air Force priority in fielding the scheduling program during the research period.

range training requirements and organizing them into a series of training categories. These are authoritative tactic-based mission profiles that can help schedulers and program managers plan range use. Training program managers need to integrate these requirements into their program requirements. Doing so will allow integration of the mission profiles into enterprise scheduling programs for decisionmaker analysis or for units using CSE for long-range planning. Range managers could also use these objective mission profiles to help improve range organization for the future. Other analytic tools could use this information and the broader information environment CSE provides, once it has been implemented across the range community.

Today's Changing Range Environment

In recent years, range demand and usage have undergone dynamic changes. There have been four primary drivers of these changes:

- **Changes in training needs.** Since September 11, 2001, Air Force units have sought combat-focused, shorter-notice continuation training. Along with this change has come a desire for tactically robust ranges to expose units to realistic environments prior to deployment. More training has focused on meeting rising deployment tasks within the unit's broad desired operations capability. Unit commanders have gained more authority to shape their training activities, working within guidance from training program managers (Air Force instruction and supplements and tasking messages) and fiscal constraints (e.g., annual and quarterly flying hour allocations).
- **Resource constraints.** As defense spending tightens, budget constraints are affecting the acquisition of new range systems and sustainment of existing range capabilities. These constraints will require range operations to become more cost-efficient while maintaining sufficient capabilities. Contingency funds for range operations may decline as deployment operations wind down and/or be more normalized within the range program.
- **Encroachment**. Civilian populations near ranges limit how the facilities can be used. A number of factors cause encroachment pressures: growing civilian populations in close proximity to ranges, energy development programs that seek to install wind turbines on land now set aside for Air Force use, and the increasing demand for airspace to accommodate the growth in civilian air traffic.
- **Next-Generation Air Transportation System (NextGen)**. The impending implementation of a Global Positioning System satellite-based tracking and routing system for all aircraft—NextGen—will complicate the management of ranges and airspace and increase the urgency of modernizing the information infrastructure to support planning and management decisions. This system gives controllers the ability to shift air traffic dynamically, as air traffic problems develop, possibly moving the traffic over geographically fixed range infrastructures. Air traffic flow decisions will come more from a national vantage point and less from that of local terminal or regional center. Regional and local military liaisons will remain valuable, but mitigating the effects of dynamic traffic reconstruction may require a national military authority working with peer organizations (major airlines) and FAA national entities. Understanding priorities and the context for military activity will be more important in the NextGen era.

Management Challenges and Information Needs

These changes pose significant challenges for range management. The main challenges include

- clarifying the understanding of training requirements and developing flexibility in the response to continuation-training needs
- creating realistic range environments according to objective test and training expected outcomes
- understanding competing priorities for range and airspace allocation.

A common data approach across ranges would help the Air Force address these challenges. A common approach would help units find training opportunities, range managers understand range use and posture them to anticipate range demand, and program managers and higher command levels make informed decisions about improving and advocating for range capability and capacity. Units have a finite time to train to meet deployment tasking but can enhance their use of this time with the help of a common information strategy that helps managers understand both the immediate requirement and its broader context. The approach does not require a common control or ownership; it focuses on creating an environment in which users can better communicate their needs, making the system more timely and richer in actionable information for managers. This approach must enlist training program managers and, ultimately, the weapons and tactics officers who create and sustain the techniques, tactics, and procedures that become the test and training template.

A range and airspace automated scheduling program could support a common data approach in the range community. Such a program could contain a catalog of range capabilities, which would allow range users to communicate range requests. CSE is an example of this type of program, one with broader information implications. The program could also give range managers access to historical scheduling information and could help them structure the scheduling dialog to work with users. Finally, the program could also inform program managers though the reports it produces. By integrating that information with other data and decision tools, managers and other range and airspace decisionmakers could examine how efficiently and effectively the range is meeting training needs and could also explore future range use. The use of a centralized scheduling program will create a unified information structure, which analytic tools require.

To provide an example of such an analytic tool, we updated an information tool—the RAND Decision Support Tool—that RAND had previously developed as part of a system to help the Air Force improve decisionmaking about ranges and airspace.[5] This tool would improve managers' access to the information needed to respond to scheduling and utilization challenges. For that to happen, a CSE report would need to be configured to provide the needed data sets. Likewise, data sets from the RAND tool would be modified and incorporated into CSE. Since CSE is a relational database, it should be useful to report data for a wide range of decision tools. See Appendix B for more details about this tool.

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[5] Robbert et al., 2001b.

Implications for the Air Force

An implication running through all these challenges is the need for enhanced information practices and a higher-level perspective on range demand and usage than the current, local information-infrastructure affords. Units are interested in a wider, regional set of realistic or more-specific range experiences (e.g., close air support working with a ground element) and in scheduling tactical sorties, when the range complex will support them. These challenges require managers at all levels to possess a greater depth of information about range demand, usage, and user expectations than they currently have.[6] Our analysis suggests four general implications for how the Air Force can respond to these challenges:

- **Specify required training resources.** Statements of range and airspace requirements need to be more specific, more comprehensive, and more timely than they are at present. Under the current model, some ranges are underutilized, even as some units need additional range training opportunities. In addition, range complexes become reactive when managers lack timely and accurate information to posture range contracts and personnel and make prudent investment decisions. With a broader view of and more timely information on training needs, program managers can ensure that decisions about MAJCOM operations, range maintenance funding, and range operations contracts properly anticipate surges in range operating tempo. This strategy can balance local range capabilities against off-station training opportunities, thus minimizing range operating costs and providing units with operational flexibility to meet training requirements. An optimal strategy requires the ability to collapse planning time lines and even support modeling different operations approaches with their effect on capacity.
- **Collect range usage data.** Range managers and users alike would benefit from detailed data collected from completed training activities. To make this possible, unit flying scheduling programs need to be able to feed mission information into the range data archive for each sortie, comparing the mission profile scheduled with the mission profile flown. Storing data in a relational database could also help the system respond to FAA's anticipated requirements for computer-to-computer reporting. Recording actual use rather than scheduled use will facilitate range management because it allows managers to make decisions based on real data instead of forecasts or extrapolated information. This means that environmental management tasks can be planned when actually necessary instead of when they are forecast to be necessary based on scheduled use. Greater information precision keeps areas active and expends funds only when necessary to remain within environmental regulations.
- **Define range expectations more clearly.** In response to external pressures, the Air Force must be more deliberate in justifying its range use. Toward that end, range managers need complete information about the intent of range activities. Using mission profiles linked to joint mission objectives would help satisfy that need. The information does not need to be detailed but does need to be correct to build public confidence and trust.

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[6] User expectations are important to know because this research found units adapting their activities to the range infrastructure available to them. For example, we found units reserving large maneuver areas and dividing them into smaller areas for the use of separate groups. Units would develop local procedures for maintaining separation within the larger area. If range managers understood this need, they would have the opportunity to structure the area to facilitate this type of use, perhaps freeing a portion of the area for other users.

Much of the range complex infrastructure uses public lands. The Air Force also leverages the range capabilities of other services and foreign hosts. Better defining test and training expectations helps to establish the high priority of range activities. When events occur that affect range activities, managers at all levels are better equipped to respond in ways that preserve expected outcomes.

- **Provide range information that goes beyond the local level.** Users and managers alike would benefit from a regional or national perspective on range availability and demand. Units are seeking training opportunities well beyond their historic local range community. Managing range resources needs this broader perspective too. In addition, this higher vantage point can help the Air Force prepare for the transition to NextGen, which will require the Air Force to make more timely range operations data available to FAA monitoring systems. Units are seeking range capacity on a regional and even national level to meet deployment taskings and conduct mission rehearsals in near combat conditions. Even local resources will have multiple users beyond the operating wing or group. This requires a higher vantage point from which to make informed decisions about range investments and priorities and even to manage contracts affecting the daily range operating tempo.

Recommendations for Possible Air Force Responses to These Challenges

To act on these implications, the Air Force needs to improve the data it generates and collects on range and airspace usage and to develop a strategy for incorporating the data into a common enterprise system for Air Force ranges. A key part of this is a more-unified approach to training—especially continuation training. Possible specific responses could include

- **Developing training templates for use in scheduling.** Units that schedule training can help range managers understand their training needs by using tactically based mission templates that capture the basic requirements of various training sorties. The templates would originate with MAJCOM-level tactics officers, instructors, and training program managers. This information could include the airspace and range capabilities required to meet the training objectives and any additional requirements, such as a radar threat, coordination with a tactical ground element, or aircraft sensors that work with other aircraft in close air support.
- **Making an automated scheduling tool the standard format for range training archives.** Information on completed training activities can be stored in the scheduling tool's database, which will furnish Air Force managers and decisionmakers with detailed information on how ranges are actually being used.
- **Using an automated scheduling tool to influence the range "market."** The range community can use the tool's information structure to encourage adoption of data standards as a condition of range use. The ability of such a system to share data with other decision tools will benefit decisionmakers at all levels. It will also benefit users because they will encounter a common transaction process to secure range access. A market will form as providers inside and outside the Air Force adopt the automated system. Scheduling can be rolled up for smaller range complexes without owners losing control over their range complexes. With a fully functioning common market for range access, it would

not be necessary to own or operate every range complex. Managers would use the market structure to allow a wider set of users to participate. Rules governing unit priority in the retail transaction would provide a means for local managers and MAJCOMs to focus range capability as they believe necessary.

- **Using the tool at higher levels.** In addition, a scheduling tool can be networked so that it can share information with program managers and other decisionmakers about how well range use is meeting training needs. The program can create reports that provide information about individual complexes and can document usage across the entire enterprise. Armed with better information, range managers can become more effective advocates for ranges. They can also be better prepared to evaluate alternative use proposals and the potential consequences for range operations. The enterprise vantage point, once established, can help inform local decisions. Transferring ownership is not necessary to improve the effectiveness of operations. The range market that emerges helps inform managers at all levels.
- **Preparing data that are compatible with FAA's planned NextGen system.** The Air Force must also establish an operational-level counterpart to work with the FAA as the NextGen system is implemented. This counterpart must have the military enterprise authority necessary to successfully interact with NextGen-era planning and controlling entities to preserve access when NAS operations shift geographically or temporally. As NextGen systems are fully implemented, the FAA's new ability to view special-use airspace status and act on what it sees will pressure the Air Force to open military test and training areas to commercial air traffic. As NextGen is fielded, some of these tasks may be automated. The FAA expects that data on military's use of ranges and airspace will be transmitted using the same new GPS-based machine-to-machine reporting system that commercial air traffic will use. The vantage point needed is one that encompasses all MAJCOMs with flying units. The Air Force should explore ways for this to happen using the CSE capability to automatically feed special-use airspace scheduling into the FAA flight planning and en route systems.

Concluding Observation

The challenges of range management arise from the need for better information about range demand, supply, and usage and the need for a standardized infrastructure for sharing that information across the range community, users, and other stakeholders. We see implementation of an automated scheduling tool as key to the Air Force's efforts to address these challenges.

It is possible that, through the common web-based enterprise scheduling program and analytic tools it supports, a national market for range capabilities may emerge as range providers opt into that program. It is possible that access to a regional or national network of range capabilities will become more useful than a local standalone range complex. What is evident is that, under such a market approach, units and MAJCOMs that participate and provide more information about their test and training requirements will lead the evolution of ranges even under the present system. Timely information provided in a context of intentions and purpose will help managers act precisely and advocate for their users. Range development could better incorporate operational needs if unit planning were more timely and complete. Local leadership from assertive and well-prepared units could have more influence than today not just on

long-range planning but also on the range operating tempo as managers gain more confidence in meeting unit expectations within management time lines.

With more information being shared with the range management community, units may also benefit from participating in an enterprise scheduling transaction. They can now better gauge the opportunity to train using regional and national resources when their demand exceeds local capacity. This is more likely to occur with compressed deployment time frames or when live ordinance training needs exceed the capabilities of the local range. The market approach may help encourage a better balancing of global management, using this vantage point to improve trade-offs and force structure planning. Units with local ranges having special capabilities would benefit from higher utilization and justification for further improvement. Use can be better balanced to support operational surges and periods where the unit may be reconstituting its force structure. Improving the information infrastructure that supports range management should help Air Force units better communicate their demand, thus helping range management become more effective and efficient.