SOCIETY OF AMERICAN MILITARY ENGINEERS • JULY-AUGUST 2015 • VOL 107 • NUMBER 696

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A Comprehensive Approach to Runway Reconstruction Projects

Numerous benefits can be realized by utilizing a more comprehensive approach to runway reconstruction projects rather than simply restoring the pavement condition.

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Runway 6-24 at Joint Base McGuire-Dix-Lakehurst and four connector taxiways were rebuilt in 2011. During the project, construction trucks were routed through a secondary entrance to alleviate a potentially huge burden on security staff and eliminate delays that could have arisen if long lines of trucks were backed up at the front gate. PHOTO BY TOLTEST INC.

Closing a runway for reconstruction is not a routine event. It can cause major setbacks to airfield operations and associated impacts to base operations. Many times, the runway is central to the mission of the installation, especially for the U.S. Air Force. Loss of access can present significant impacts to overall base readiness or the ability to mobilize in the event of a deployment.

While the technical solutions for pavement rehabilitation may seem fairly straight forward, there is much to be said for applying a more comprehensive approach to address challenges and uncover opportunities that can add value to the project.

In recent years, there has been an increasing trend toward embracing Total Value Delivery for airfield improvement projects at military facilities. The benefits of taking this more holistic approach are numerous—but there are considerations that have to be understood as well.

SEEING THE BIG PICTURE

Airfield rehabilitation projects are generally defined within a comprehensive base improvement program and are most often prioritized according to pavement condition. It is common for projects, including major runway rehabilitations, to be addressed in isolation of other priorities.

Taking a more holistic view of the airfield as a multi-component functional facility—rather than individual, separate systems—encourages decision-makers and designers to look at a major airfield pavement project as an opportunity to consider the benefits of other adjacent improvements in a cost- and time-effective manner.

It also is important to consider what other items in the runway safety area, such as connector taxiways, airfield lighting, electronic navigational aids, or storm water drainage, might need to be addressed in the coming years, and consider whether it is beneficial to address those during the runway closure or risk another closure in the near-future. Because every base is unique, this assessment must be examined from a cost/benefit perspective, in terms of both capital costs and operational expenses. Economies of scale often will tip the balance towards bundling projects together instead of addressing them in isolation.

McConnell AFB, Kan., took this approach on a major $100 million program that involved seven independent construction packages and upgraded nearly all of the substandard runways and taxiways. While initially the project was driven by deteriorated pavement conditions, designers worked with base staff and engineering leadership to develop a more comprehensive strategy that took advantage of the closure opportunities. On the recently completed West Runway reconstruction, edge light systems, signs and approach lighting systems at both ends of the runway were upgraded to meet current criteria simultaneous with the pavement reconstruction. In addition, the geometry of connector taxiways was updated to eliminate excess pavement, while providing sufficient pavement to meet current and future mission aircraft like the KC-135 and KC46A.

Airfield lighting home run duct bank being installed during the West Runway pavement reconstruction project at McConnell AFB, Kan. PHOTO COURTESY CMT

The scope of the West Runway work originally planned to reconstruct the "keel" of the runway—the center 80-ft through most of its length where the pavement condition was at its worst. However, that was problematic because it would require full-depth demolition, exposing the underlying subgrade soil to the elements and risking weather delays.

Through careful analysis, designers were able to show that the top surface of the entire runway could be replaced for the same cost as the full-depth keel. The Total Value Delivery approach also allowed reconstruction of paved shoulders and subdrainage systems to be added throughout.

LONG-TERM IMPROVEMENTS

At Little Rock AFB, Ark., the planned reconstruction of the primary runway has been aligned with a mission-driven need to upgrade the Instrument Landing System from a Cat I to a Cat II configuration.

The base is the primary home for Air Mobility Command's C-130 operations and training, and is in the process of transitioning to the new "J" model equipped with Cat II capability. Once the pavement work is done, the upgraded Instrument Landing System will enable training sessions on site, eliminating the use of nearby civilian facilities. The project demonstrates how a comprehensive approach to runway repairs can allow the owner to recapitalize infrastructure to keep pace with aircraft modernization, while at the same time minimizing disruption to operations that two separate projects would have caused.

MAINTAINING THE MISSION

Coordination with flying missions is essential to understand how a runway closure will affect routine operations and potential mobilization. This is especially critical at single-runway facilities.

Recent work at Fairchild AFB, Wash., required relocation of its Air Mobility Command and Air National Guard refueling wings to Spokane International Airport and an auxiliary facility in the town of Moses Lake during the nine-month construction period. Although this deployment required establishing support operations at the temporary site and running daily shuttle buses over a significant distance, that was deemed to be a beneficial solution because it reduced the overall project duration from three construction seasons to just one.

Even at multiple-runway facilities, a single runway reconstruction can have a significant impact. Secondary runways may not accommodate long-haul operations, or, in the case of a recent project at Cannon AFB, N.M., a single project may affect both runways. Because Cannon's two runways intersect, reconstruction of the intersecting segment required that aircraft be relocated for a short period of time.

At certain locations, the critical nature of the flying mission drives special considerations when choosing the reconstruction approach. At Osan AB, Republic of Korea, a conceptual study was completed years prior to planned runway reconstruction to identify multiple execution approaches with different operational constraints.

Planners examined several phasing scenarios—including maintaining a temporary landing zone throughout construction, relocating runway operations to a parallel taxiway, and reconstituting the runway quickly to provide an alternate combat runway (7,500-ft by 100-ft) at any point during the project. Estimated costs ranged from $29 million to $44 million, depending on the reconstruction method (full-depth removal and replacement or overlay) and the operational constraints imposed on the contractor during construction (one phase or multiple phases).

CHOREOGRAPHING CONSTRUCTION

The volume of materials involved in a major runway reconstruction can be significant. Proper planning will go a long way towards avoiding delays or overextending resources. Working with base security and engineering staff to address such aspects as contractor access and batch plant operations are crucial.

The reconstruction of a 10,000-ft by 150-ft runway at Joint Base McGuire-Dix-Lakehurst in New Jersey required that massive volumes of materials be delivered to and hauled away from the base—approximately 50,000 truckloads total. Over a year-long construction period, this equated to more than 150 additional trucks per day over a six-day work week. Designers knew that this increased traffic would overwhelm security staff charged with inspecting each vehicle that entered the base. Airfield management and security forces were consulted early on to arrive at a plan that would mitigate this situation.

The preferred alternative was to fence-off the entire runway complex so that the construction zone could be placed in a different security status, thus eliminating the requirement for detailed delivery truck searches. This alleviated a potentially huge burden on security staff and eliminated possible construction delays caused by long lines of trucks waiting at the gate. An alternate construction entrance through a minimally used back gate removed construction trucks from most of the base's roads.

ENGAGING STAKEHOLDERS

While properly reconstructing a runway requires a high degree of technical proficiency, successful project delivery demands an even greater degree of planning and coordination, especially when incorporating a more comprehensive improvement.

The ability to develop an effective stakeholder involvement process is critical for achieving the maximum value. This can only be achieved if all concerned parties are fully engaged—from early in the planning process and through construction.

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