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# TME

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# Design-Build for Joint Basing

An integrated design-build approach in support of a fast-track strategy enabled the successful completion of a joint Air Force-Navy Human Performance Wing.

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The Maj. Gen. Harry George Armstrong Complex at Wright-Patterson Air Force Base (WPAFB), Ohio, has become the military focal point for the study of human performance under extreme conditions of 21st century warfare.

Constructed as part of the Base Realignment and Closure program (BRAC), the \$220 million facility consolidates research functions that were formerly spread across the country, and houses educational facilities in an academic-style environment. The facility represents the largest construction project at the base since World War II and was recently awarded LEED Silver certification from the U.S. Green Building Council.

The 680,000-ft<sup>2</sup> facility was conceived to accommodate the recently established 711<sup>th</sup> Human Performance Wing (HPW), which consolidates the Air Force Research Laboratory's Human Effectiveness Directorate with components of the 311<sup>th</sup> Human Systems Wing from Brooks City-Base, Texas, as well as the Navy's Aerospace Medical Research Unit (NAMRU-D), relocated from Pensacola, Fla. In its mission "to advance human performance in air, space and cyberspace through research, education and consultation," the 711<sup>th</sup> HPW utilizes sophisticated facilities to integrate biological and cognitive technologies under its Human Effectiveness Directorate—performing research and providing education and consultation. In addition, the HPW hosts the largest aeromedical library in the world through the USAF School of Aerospace Medicine.

"There was an enormous number of requirements that these end users had to employ in order to become operational

under one roof, and the goal was to have construction completed to meet the 2011 mandate," explains Dave Mankowski, Senior Project Manager for the design-build team that worked with USACE and WPAFB officials to construct the new complex within the 32-month contract schedule. The team was formed through a joint venture of Archer Western Contractors of the Chicago-based Walsh Group, and Butt Construction Co., of Dayton, Ohio, and included Cannon Design as the designer of record.

## BENEFIT OF BEST VALUE

"The decision to achieve the project through design-build," explains USACE Area Engineer Kevin Jefferson, "was predicated on time requirements to meet the BRAC deadline. Working the numbers backwards, we realized we didn't have the time for a design-bid-build approach. In order to comply with the law and meet requirements of users, the design-build option was seen as the delivery method most suited to achieve the 'benefit of best value.'"

Before any dirt could be turned, however, the facility concept needed to take shape by sorting out the multitude of attributes necessary to meet various end-user requirements.

"We worked very hard with eight different user groups in the process of collecting and consolidating requirements to determine what the beast was going to look like," notes USACE Project Manager Dewey Rissler. "Utilizing a process that yielded 'bridging documents'—schematic design drawings created for handoff to the design-builder—we were able to jump-start the process."

An integrated design-build approach ensued in support of a fast-track strategy that would bring the project to early completion, enabling USACE to significantly move up the facility's turnover date to the end user.



The 450,000-ft<sup>2</sup> South Building in the Armstrong Complex at WPAFB is designed for human-centered biomedical research and holds laboratories specializing in radiology, acoustical, visual, vestibular, cognitive, psychopharmacological, and thermal stress. IMAGE COURTESY CANNON DESIGN

## ROCKS IN THE ROAD

The USACE Louisville District recognized early on that there were many potential "rocks in the road." As recognizing risks was essential to moving forward with a fast-track, design-build strategy, USACE moved to add significant value to the project delivery process by building and leading a large "team of teams" focused on the common goal of meeting the client's mission-critical scope, schedule and quality expectations.

During an initial partnering session among government and joint-venture partners, one of the risks identified was constructing a facility to support research and teaching while the procurement of highly specialized equipment was still underway. Another was anticipating and meeting requirements of a newly established command. Some 6,000 comments

that researchers and medical staff provided on the facility design had to be filtered by the design and engineering team.

Design and engineering, along with material and equipment procurement, would be accomplished by the design-build team, with its leadership orchestrating the plan. Part of this orchestration was conducted through issuing 10 separate design-submittal packages—a tactic that facilitated concurrent construction phases.

From the beginning, Cannon Design's team of architects and engineers understood that the project depended on the ability of its network of technical staff to work in a concerted, coordinated fashion to meet the schedule. Effective communication protocols were established so that both incoming and outgoing requests for information could be answered quickly by the various stakeholders, enabling design work to continue without interruption. Involving subcontractors early on in the process contributed greatly to streamlining the design. For example, mechanical, electrical and plumbing specialty consultants were able to collaborate with designers and constructors in a highly synchronized CAD environment.

Additionally, the Archer Western/Butt/Cannon Design team suggested and engineered a framing system consisting of a cast-in-place concrete frame for portions of the facility in combination with structural steel for substantial portions of the North and South buildings. This 50-50 steel-and-concrete framing solution permitted construction operations to commence immediately upon completion of foundations while the structural steel package was being fabricated.

Given the notice to proceed in spring 2008, the plan had been further enhanced by adjusting the schedule to begin site excavation in July of that year instead of September as previously planned. The team also took advantage of environmental permitting previously granted for a Phase I infrastructure commission. By October, concrete was being poured.

## SMOOTH AND ORDERLY

These adjustments worked together to achieve valuable time gains. Interior trades were able to begin work sooner

than a conventional steel-framed building solution would have permitted. A hedge against weather delays was created by achieving the project's goal of completing the South Building's exterior envelope and permanent mechanical systems by the winter season of 2009-2010. To achieve efficient South Building enclosure, the exterior pre-cast panel skin was sequenced to begin on the cast-in-place concrete frame at the same time the structural steel erection was occurring. This sequencing maximized pre-cast panel erection and minimized field logistics concerns.

The result of resourceful planning and coordination would yield benefits to the end users of the new facility. Bringing the research device designers in early helped ensure that key components integral to the construction would be effectively coordinated, keeping vital end-user mission activities on track.

"The process supported a smooth and orderly transition that allowed us to continue doing research uninterrupted," said Cdr. Rita Simmons, Executive Officer of the Naval Medical Research Unit. According to Cdr. Simmons, no deadlines were missed and the early move-in gave the unit an advantage in establishing relationships with institutions in the Dayton area.

Collaboration also was at the core of the partnering philosophy. By defining common goals early, and fostering open and clear communication among stakeholders, the project team was able to effectively respond to the project's challenges, while managing changes to the program requirements. In this, the project team was aided by the efficient integration of disciplines made feasible through the design-build delivery method.

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## MISSION-SUPPORT SPACE

The massive Armstrong Complex at WPAFB consolidates research functions formerly spread across the country, each focusing on specific training and research missions. The Air Force's 711<sup>th</sup> Human Performance Wing integrates biological and cognitive technologies for research, education and consultation. Armstrong Complex occupant NAMRU-D relies on a range of specialized lab devices and facilities in its work to maximize warfighter performance and survivability through aeromedical and environmental health research in spatial orientation, environmental toxicology and aviation safety.

The complex, which represents the largest building construction contract ever administered by the USACE Louisville District, prominently features these structures:

- **South Building.** At 450,000-ft<sup>2</sup>, the South Building is designed for human-centered biomedical research and holds laboratories specializing in radiology, acoustical, visual, vestibular, cognitive, psychopharmacological and thermal stress. A high-bay space designed for aeromedical teams training in critical care air transport evacuation, can accommodate fully functional airplanes, helicopters and other rescue equipment. Also included are biosafety level 3 containment labs, and classrooms, auditoriums and administrative offices designed to serve approximately 6,000 military trainees annually.
- **North Building.** The 200,000-ft<sup>2</sup> North Building contains endurance and training equipment such as a disorientation device, altitude chambers and a human centrifuge, that permit research into human performance under stressful conditions. The Vertical Linear Accelerator Lab, monitors the effects of rapid vertical acceleration, simulating the extremes experienced by a pilot in combat conditions.