

NASA Facts

National Aeronautics and
Space Administration

Marshall Space Flight Center
Huntsville, Alabama 35812



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External Tank Return to Flight Focus Area

Protuberance Air Load Ramps or PAL Ramps

To minimize the potential for debris loss from the External Tank, NASA has completed a top-to-bottom assessment of the tank's Thermal Protection System. The Agency has examined all areas where the tank's foam insulation, a component of the Thermal Protection System, is prone to loss. The External Tank Project Office has re-evaluated the existing design of the tank's protuberance air load ramps -- known as PAL ramps -- because the ramps, which consist of thick, manually sprayed layers of foam, could, if liberated, become a source of debris.

The PAL ramps are designed to prevent unsteady air flow underneath the tank's cable trays and pressurization lines during launch. One ramp is near the top of the liquid oxygen tank, close to the nose cone; the other is below the intertank, near the top of the liquid hydrogen tank.

NASA plans to fly the next tank, ET 120, with the current design configuration.

Three redesign options under consideration for future flights include elimination of the ramps; reducing the ramps to "mini" ramps, about one-third the size of the present ramps; or building a trailing edge "fence" on the back side of the cable tray. The fence would act like a nozzle throat and prevent unsteady flow under the cable trays.

The External Tank Project Office will continue to evaluate the redesign candidates and, after completing a comprehensive testing and analysis program on the options, select one for implementation.