

Investment Casting Spotlight

Complex Internal Passages Shelled, Not Cored in Aristo-Cast Aerospace Part

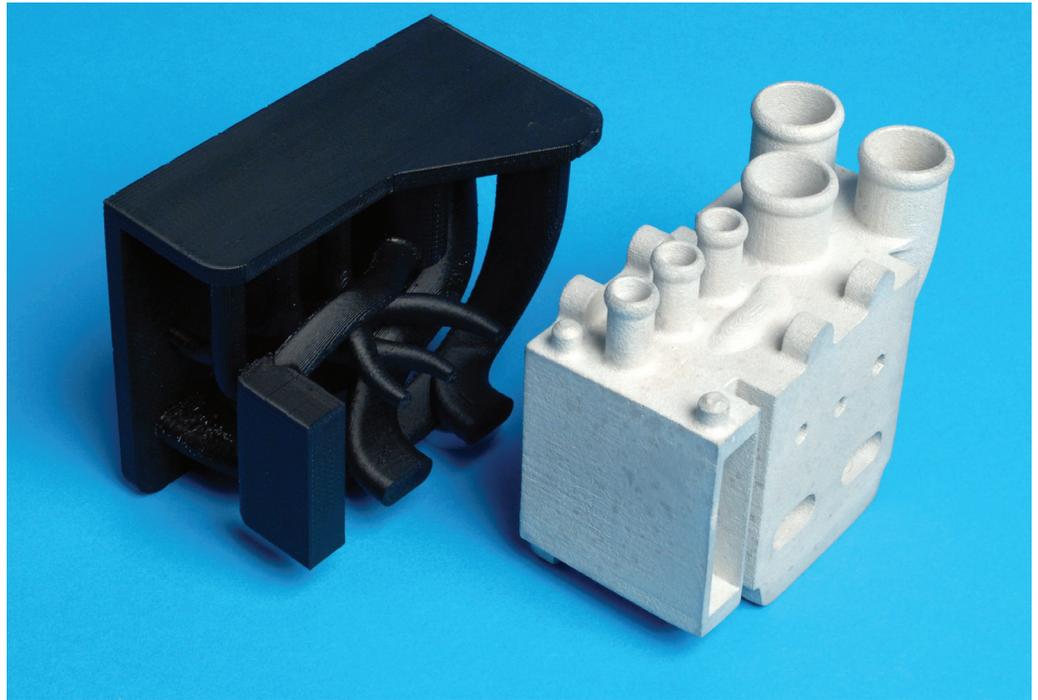
The investment casting process is known for its design freedom, but Aristo-Cast, Almont, MI, took the flexibility of the process one step further with the manufacture of an aluminum center body with complex internal passages.

At first glance, the order for aerospace prototypes did not seem to present a difficult casting design, but further examination revealed some extraordinary challenges.

As engineers began the process of designing gating and establishing the total casting process, it became apparent that coring would require the most engineering. Due to the size and complexity of the internal holes and passageways, the logical approach would have been to use preformed ceramic cores, but the budget established by the customer and time constraints simply would not allow this option.

Using a CastForm™ pattern with all the holes and passageways in place, Aristo-Cast set out to shell the internal passages rather than use ceramic cores or inserts. (CastForm patterns are plastic rapid prototyping patterns produced by selective laser sintering.)

Holes and passageways in the patterns were first inspected by flow check and



Internal passages in the casting on the right were shelled, not cored by Aristo-Cast. The black figure on the left is a plastic representation to illustrate the complexity of the internal passages

bore scope to ensure that all passages were clear.

“Utmost care” were the key words during the shelling process. Failure of a single internal passage would render the casting unusable and place the overall project in jeopardy.

Using a proprietary ceramic material, shellbuilding personnel began the process with a first and second coat. After each coat, the holes were inspected to make sure they remained open. At this point, the holes were

filled with the same ceramic material. A hand-held semi-pneumatic device, developed by Aristo-Cast, was used to force the material through the passages, thereby assuring that no air pockets were present. From this point on, standard shellbuilding parameters applied.

After casting, another challenge remained—how to remove the internal ceramic material without destroying the castings. The exterior was water blasted to remove the ceramic shell, but this process

could not dwell on the holes without damaging the soft aluminum.

Detroit-based Kolene Corporation supplied the answer with a proprietary caustic leaching process designed for aluminum. The operation was a three-day success.

After cleaning, inspection and heat treat, the parts were ready to ship to the customer. Aristo-Cast overcame the difficulties of the design and still produced the prototypes in 28 calendar days.