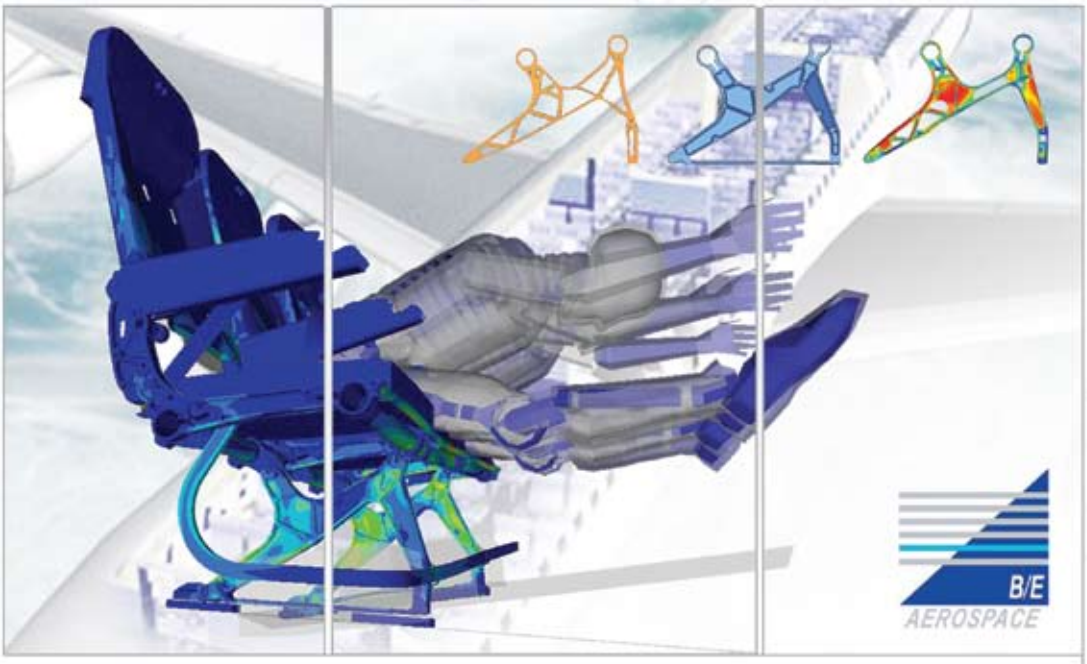
HyperWorks®

A Platform for Innovation™



HyperWorks at B/E Aerospace:

Lighter, Safer Seats for Airline Passengers

When you settle in for a flight on a major airline, you are probably in a seat and surrounded by equipment designed and built by B/E Aerospace. With design and manufacturing facilities across the globe, B/E Aerospace is the leading manufacturer of cabin interior products for commercial and private passenger aircraft. One of B/E Aerospace's leading products is its line of commercial and business airline seats. These seats are engineered and tested at its Commercial Airplane Products Group in Winston-Salem, North Carolina.

An Altair HyperWorks Success Story

Altair® HyperWorks® at B/E Aerospace

Lighter, Safer Seats for Airline Passengers

B/E Aerospace designs commercial airline seats, along with many other furnishings for aircraft interiors, at its NC facility. Its design and finite-element analysis (FEA) teams share a motto: A Cheaper Ticket and A Safer Ride. Today's fuel prices are forcing airlines to 'Lighten Up' literally and they are finding inventive ways to reduce weight within an aircraft. In this light, carriers have resorted to such measures as reducing the amount of periodicals, completely removing magazine racks, removing on-board ovens, replacing cabin dividers with curtains and reducing the weight of aisle carts as part of a drive to save fuel. Weight reduction lowers fuel costs and ultimately ticket prices. Stronger components provide better passenger protection in emergencies. B/E Aerospace strives for both.

Adding HyperWorks and CAE to the Product Cycle

Impressed by the success of HyperWorks at B/E Aerospace's Miami facility, where engineers design first class seats for private jets, the Winston-Salem facility contacted Altair Engineering. Altair then placed one of its highly qualified engineers on site for three months to help support the design of their latest commercial seat products. During this three month period the on-site engineer clearly demonstrated the benefits of computer aided engineering (CAE) using HyperWorks tools. Yanbin Liu, lead structure and certification engineer, was hired and tasked with improving B/E's design process by developing a process for virtual certification by incorporating advanced CAE methods. By utilizing Altair HyperWorks within the product development process Dr. Liu has seen remarkable success. During the early development of B/E's new Spectrum seat line, he was given a typical leg-and-spreader unit for analysis. Using Altair HyperMesh and the topology optimization capabilities of Altair OptiStruct early in the design process he was able to reduce the weight of the part by 32 percent. This design, while not yet in production, clearly represents a major success in terms of weight and fuel savings especially when you consider the number of seats on a Boeing 787 or an Airbus A380.

"In July 2007 I contacted my local Account Manager, Stephen Aljets of Altair Engineering, and asked for an evaluation. The local Altair team was really supportive in assisting us through the evaluation process. By October we had HyperWorks licenses."

Yanbin Liu, Ph.D,
Lead Structure and Certification Engineer
B/E Aerospace

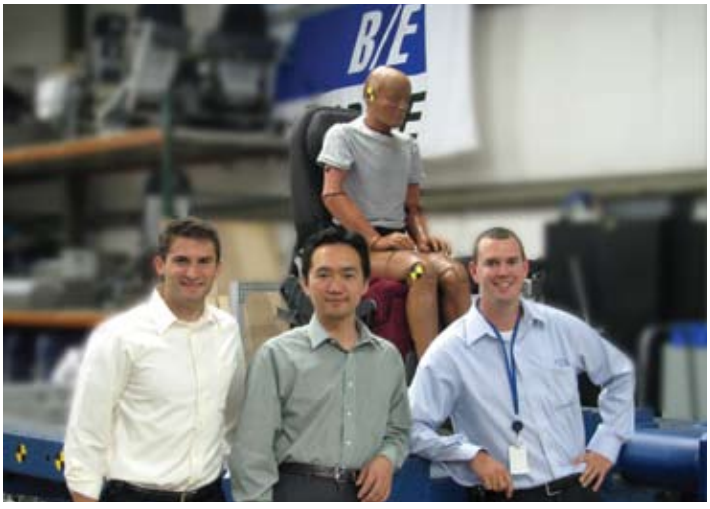
"OptiStruct gave me a good idea to work with," says Dr. Liu, "and the pattern is very accurate. We can start with a guess, but OptiStruct really helps us to get a better result to begin with."

Cutting Certification Costs

The design of airline seats is completely market-driven. Airlines want comfort and features for their passengers, and they inevitably ask for lighter seats to help fight the relentless increase in fuel costs. B/E Aerospace designers work hard to accommodate them – within the constraints of safety certification.

For the product to be certified airworthy by the U.S. Federal Aviation Administration (FAA), it must pass destructive physical tests overseen by a FAA-certified DER (Designated Engineering Representative). A set of complete seats, with belted-in crash dummies, must pass static load tests. Then, mounted on a sled, they're subjected to dynamic inertial loads in a crash test. They must withstand a horizontal load of at least 16Gs (where 1G equals the force of gravity), a vertical load of 14Gs, and pass a head injury criterion (HIC) test.

So when the design engineering team first sends a prototype CAD model to the CAE team, the unspoken question is, 'Will this design pass certification?' and this group becomes the link between design and FAA approval. They bring the model into HyperMesh, run several crash simulations, use OptiStruct to fine-tune the model, and send it back to the design engineer. The goal is to reduce the number of physical tests it takes to certify the product, partly to reduce the cost of the preliminary tests (saving up to 60%) and partly to keep the production cycle as short as possible. "Utilizing this FEA technology is a great engineering tool in order to reduce program design cycle times, improve our First Time Yield during Dynamic testing, and also optimize the part design for weight and cost." says Steve Kash and Jacob Valentine.



Steve (CAD), Yanbin (CAE) and Jacob (Certification)

"Without the CAE analysis, they may have to do three or more physical tests," says Dr. Liu. "The CAE tools enable us to achieve virtual certification that may eliminate initial failures. There's a big saving there."

Helping to Drive and Accelerate Design

Dr. Liu and his co-workers are currently working to reinvent seat design and create a virtual validation certification process within B/E Aerospace using Altair HyperWorks. Besides expediting certification with simulation, they are also using OptiStruct and MotionView to find more efficient and better ways to design seat structures while at the same time improving the product cycle time in an increasingly demanding market.

"For major changes, the designer needs to change the profile", says Dr. Liu. "But for minor changes, we can simply change the geometry in HyperMesh and have the model ready for review in one day. We can definitely further shrink the production cycle this way."

B/E management is expanding its CAE capability to take advantage of these benefits. By the end of 2008, they plan to have three additional engineers working on certification and structure design, using HyperWorks tools to help B/E design and build an even better airline seat. This is a "win-win-win" success: better safety and comfort for passengers, reduced fuel costs for the airlines, and by reducing pollution a step forward for the environment.

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