

*This reprint from the Boeing Company's newsletter "Plane Talk" is a tribute to Don Masingale, who retired at the end of April, and also shows how information about TRIZ is spreading throughout Boeing.*

# PLANE TALK

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## TRIZ-Boeing

By Fred Solis

In the high-tech world of aircraft design and manufacture, solutions to complex problems don't grow on trees. Or do they?

Talk to Wichita's Don Masingale, and he'll tell you that TRIZ (pronounced trees) holds the answer to about any engineering problem you can imagine.

"TRIZ is an innovative tool we use to solve problems," Masingale said, Senior Engineer-Scientist Advanced Engineering Research Product Definition. "It helps people focus in and get to the root of the problem."

An acronym for the Theory of Inventive Problem Solving, TRIZ is a systematic process of analyzing and applying solutions that traces its roots to the Soviet Union of the 1940s.

There, Genrich Altshuller, a worker in the government's patent office, reviewed thousands of documents and discovered a degree of commonality upon which a vast number of the patents were based. After extensive analysis he formulated a theory that held that technological systems follow predictable patterns. He also noted that applying previous engineering design principles to a given problem often yielded a broader range of possible solutions.

In his excitement of his discovery he wrote to Soviet leader Josef Stalin, who immediately ordered Altshuller to a Siberian prison. Altshuller had great company, however, and he was able to further develop his theories with the help of his fellow imprisoned intellectuals.

Following Stalin's death, Altshuller was released from prison and he slowly began selectively sharing his invention with those he felt he could trust. Over time, TRIZ sprouted and Altshuller's method attracted thousands of followers who practiced the revolutionary approach beyond the penetrating gaze of the government.

Shortly before the collapse of the Soviet Union TRIZ began to take hold in the Russian industry, and its use began to spread. After the fall, as more and more Russians, including some of Altshuller's co-researchers, began to emigrate to the West, they took the TRIZ concept with them. Masingale first learned about TRIZ in the early 1990s.

The cornerstone of TRIZ is the concept of an "ideal" system. "Some ideal visions suspend reality and disregard parameters such as cost," Masingale said. "Then you have to ask yourself 'How do we get there?'"

Altshuller's premise was that an open-ended approach would free inventors to conceive major revolutionary solutions rather than proposing smaller incremental propositions.

"The real key to first understanding TRIZ is that it helps you develop the problem solution concept," Masingale said. "It's still up to you to provide an implementable solution derived from the TRIZ developed concept. TRIZ is a great checklist to ensure you haven't forgotten to think in a given direction, consider alternatives and current resources, and to get 'out of the box,'" he said.



“Some of the proposed solutions are interactive. You can broaden your horizons by looking at how other industries are solving similar problems. We take the next step and get out of the box and say, ‘How do we do it?’”

Altshuller also recognized that inventive solutions resolved either technical or physical contradictions in the existing system. Technical contradictions typically occur when an improvement of one characteristic translates into the deterioration of one or more other characteristics of the system. For example, increasing the strength of a structure often increases its weight, which oftentimes is counterproductive to the design objective.

To help researchers resolve engineering conundrums and contradictions, Altshuller developed 39 Engineering Parameters and 40 Inventive Principles. When combined in a grid, the TRIZ Contradiction Matrix, as the tool is called, lists along the vertical axis the features to be improved, and the undesired result or degraded feature along the horizontal axis. Finding the pluses and minuses of a potential solution then is a matter of finding the point of intersection on the matrix, and eliminating the identified conflicts.

“Sometimes the solution creates a secondary problem, but they are less of a problem than the original one,” Masingale said.

Free of the Soviet government’s constraints, TRIZ has begun to branch out. “We’ve really Westernized TRIZ,” said Masingale, who joined the company in 1991. During his off-Boeing hours he has consulted and conducted seminars and workshops in Mexico and Europe. E-mails seeking his counsel and tutoring testify to his expertise and the growing popularity of the inventive method.

Masingale has been trying to improve the innovation culture within Boeing as well, and taken on a couple of assignments as a TRIZ expert for Boeing. “I serve as a resource to others in the company,” he said.

Masingale takes every opportunity to try to sow TRIZ seeds. In addition to providing counsel, he generated information for the Boeing’s Innovators Newsletters, and has written articles for the Boeing’s Innovators Web site.

The Ed Wells Initiative, the engineering community’s continuous learning arm, also has become involved, by providing resources for training engineers in TRIZ and teaming with Masingale to conduct TRIZ training for several organizations throughout the company. The Executive Engineering Council also named a Senior Technical Fellow team to investigate the value of TRIZ to Boeing. More than 700 people have attended the five-day sessions. The Senior Technical Fellow TRIZ investigation team also recommended increasing the visibility of TRIZ among the technical and management ranks.

“It’s an innovative way of solving problems and meet all the criteria our customers want us to have, whether it’s commercial or military,” Masingale said. “When you see something this good, you just can’t walk away from it. I use TRIZ everyday in my thinking and processes.”

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***Editor’s note:*** Don Masingale is retiring from Boeing at the end of April, but the TRIZ “seeds” he has sown by training colleagues in the methodology will continue to grow within the company. Masingale will continue to be a consultant to universities, to Boeing and to companies that are not Boeing competitors.