



SUPPLY CHAIN DISRUPTION IN THE U.S AEROSPACE INDUSTRY:

Are we looking at it from the right angle?

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On May 31, 2023 at a Bernstein Conference, GE CEO Larry Culp provided a bleak outlook about the aerospace industry's supply chain problems. "Everything that we see would suggest this is going to be a daily battle for the foreseeable future," he said according to Reuters.

The aerospace & defense supply chain is under high stress due to the ongoing shortages of labor, materials and parts. Additionally, major airframers continue to increase production rates with ongoing ambitious rates



increases. In a recent announcement, Boeing set record 737 production goals to at least 57 planes per month for July 2025, which is a 42% increase compared to the aircraft maker's December 2023 schedule. The truth is that all players are struggling on a day to day to cope with production schedules and that this stress is very real. The critical question is how the supply chain will withstand this ever-increasing manufacturing demand while at the same time on time delivery (OTD) performance is slowly decreasing across the industry.

As safety production margins erode, the next topic will be to assess the impact in terms of quality that this situation creates. Safety production margins, for example, are small buffer stock in one's assembly line that can help alleviate any event and prevent disruption in case a part is delivered late. It can also be a time buffer in a delivery schedule that can absorb a transportation event, a cargo delayed or an increased customs delay. In a nutshell, it is very likely that late deliveries will lead to lower quality levels at the final assembly stage.

Given this assessment, aerospace executives must continue to create a resilient supply chain with minimal safety margin and no risk of stalling. When it comes to quality and OTD for aircraft making, anything below 100% is a critical issue, even more so if there is no buffer stock and the supply chain is under stress.

At TRIGO, our daily work is to improve the performance of the supply chain and to grow these OTD/OQD performance indicators. We manage OTD & On Quality Delivery (OQD) for 200-plus large customers, addressing a portfolio of more than 2,000 aerospace suppliers. With access to a wealth of supply chain data, there are intriguing insights about OEMs and their supply chains that are not readily available in the mainstream.

"OQD represents the percentage of parts delivered in a time period with

no quality issues compared to the total number of parts delivered. A 99% OQD means 1% of the parts have a known quality issue.

OTD is the number of parts delivered on time versus the total number of parts in a given period. A 99% OTD means that 1% of parts are delivered late.”

To better understand supply chain disruptions in the U.S. aerospace industry, we have extracted and analyzed 18 months of OTD performance (January 22, 2022 to July 23, 2023) from around 500 suppliers in the USA, pinpointing the purchasing orders, items, delays, root causes for each late delivery and lines of the corrective action plan. Then we created a simple overview.



Our analysis uncovered several findings. Overall, the data shows that the suppliers and external forces are not the only inhibitors to OTD; the end customer is another factor. When a supplier is late to supply its end customer, the responsibilities for this perturbation are much more balanced than one would believe. **As an industry average, TRIGO observes two-thirds of the late delivery events are the responsibility of the supplier in the U.S., while an average of 33% of late deliveries are the responsibility of the end customer itself.** The root causes of these 33% are, by rank in our statistics:

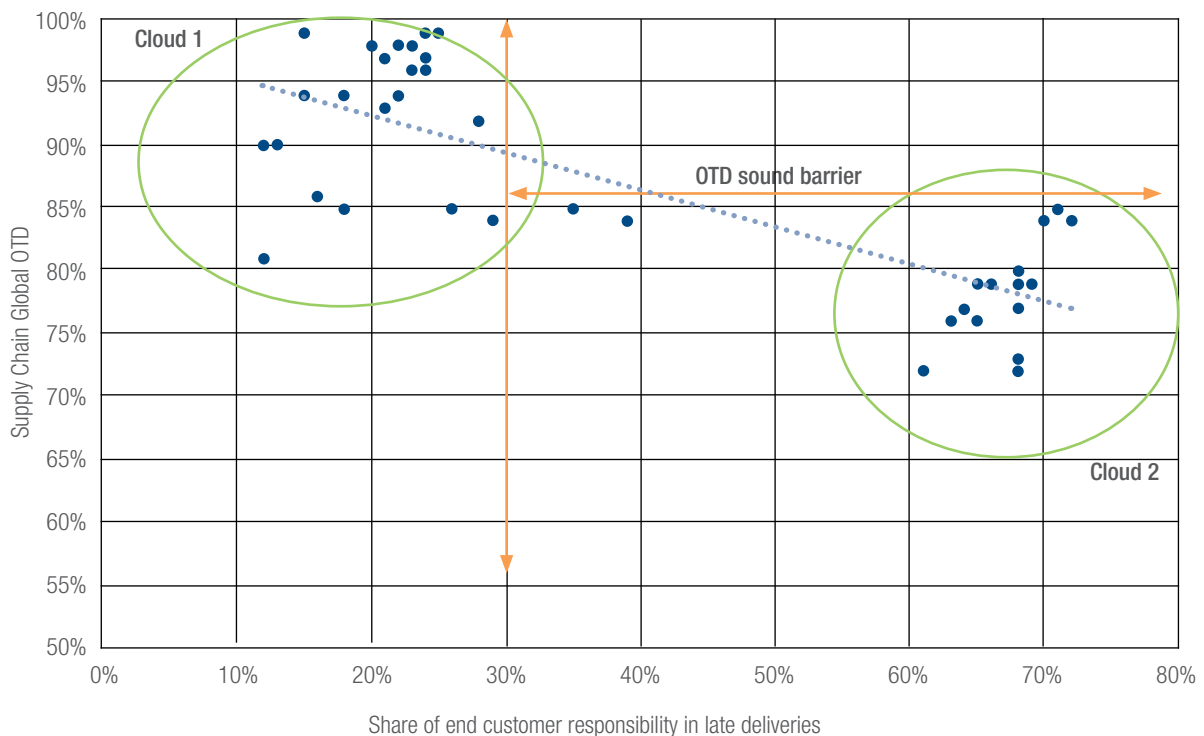
- Change of schedule
- Engineering changes, i.e., product definition maturity
- Manufacturing process changes requested by customer
- Configuration issues
- Late arrival of customer provided material or equipment
- Missing purchase orders
- Zero delay or no date purchase orders
- Late payments

Surprisingly, none of the well-known disruptions (such as manpower, material, machining) are noted. We also found that **there was always a combination of these root causes**, i.e. they do not come alone in an analysis but surely must be understood as the various symptoms of a larger issue in the supply chain operation. **It also shows they cannot be tackled independently.**



- TRIGO's OTD analysis also shows a **very interesting correlation between supplier performance and customer discipline**, as represented in the graph below. Each blue dot represents a monthly dataset of a specific supply chain for one customer (usually around 100 suppliers). The blue dot is positioned in (X, Y) coordinates with the following rule, coming from the dataset reduction:
 - X Axis being the share of late deliveries that are the responsibilities of the customer in percentage for a given month
 - Y Axis being the OTD performance, monthly, of the supply chain subset.

SUPPLY CHAIN OTD PERFORMANCE VS SHARE OF END CUSTOMER RESPONSIBILITY IN LATE DELIVERIES



We clearly see two clouds of dots:

The upper left cloud is where the end customer is in the industry average for late deliveries impact, and OTD are up to 99%

The right cloud is showing under 85% with customer-induced issues sometimes up to 80%

So, we conclude that:

- Customers and suppliers that exhibit a standard industry share of late deliveries around 30%, good to very good OTD is achievable.
- Customers and suppliers that have a higher level of customer induced late deliveries, OTD is average and never exceeds 85%. We named it the “OTD sound barrier”, as a reference to the speed of sound that can’t be reached without specific aerodynamics & propulsion enhancement.
- The following sound barrier rule emerges: **if a supply chain experiences more than 30% of delays caused by end customer, the OTD won’t exceed 85%.**

The major takeaway is that the customer’s behavior has an influence on the supply chain over time.

The OTD performance of a global supply chain is directly correlated with the behavior and timely performance of the end customer. By simply improving a customer’s discipline, accountability, program management, there’s an opportunity to reduce customer-induced late deliveries. This goal is achievable with the existing suppliers, products and programs.

Although these suggestions may easily applicable, change management is required to show how internally induced, low performance is massive. Using external experts can be a strong lever to transform the way both customers and suppliers behave, to greatly improve the partnership performance and better OTD and OQD to the end customer requirements.

Secondly, OEMs should invest in and embed predictive analytics into their operations. With the use of AI and machine learning, they enable manufacturers to be a step ahead of quality issues and minimize corrective actions. The fear, of course, is that these innovations may replace workers. The sweet spot is to combine human expertise and deep tech tools to boost production outcomes.

Given the high improvement potential that lays there and the ever-increasing pressure on production rates, OEMs should tackle these issues and consider starting with a new situation awareness paradigm.



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