Project Codename

Customer Perception and Competitive Positioning

Final Readout

[Client]

June 24, 2019

Author: Lance Miller

(Council Member)

- Research Methodology
- History of Target and Historical Strengths and Weaknesses
- Quality, Engineering and Pricing/Costs
- Industry Specific Perceptions and Positioning (Space, Military/Defense, Commercial)
- Purchase Selection Criteria and Future Trends
- Appendix

The project focused on conducting a voice of customer analysis through interviews

Overview of Project

Objectives

- Conduct a voice-of-customer analysis to understand
 - Customer perception of Target and its products
 - Target's positioning and unique value relative to competitors

Process

- Conducted 8 interviews with participants in the aerospace thermal management system industry
- Participants included individuals who
 - Interacted with Target in a variety of roles including customers, partners, competitors and individuals who advised customers
 - Had direct knowledge of Target in Commercial,
 Defense, or Space applications
- Perceptions were intended to be captured directly and not interpreted

This project was not a full market analysis, and no secondary research was conducted or included

During 2 weeks, 8 customers and other Target experts were identified and interviewed (1/2)

Name	Key Job Title(s)	Comments
1 Name	Former Director Of Engineering at Aerospace Company (2015-2017)	Commercial Customer of Target - In depth knowledge of Target with regards to the bootstrap reservoirs provided for the Boeing 787.
Name	Former Engineer, Principle Engineer, DER, Certification at Aerospace Company (1987-2015)	Commercial Customer of Target – Awareness of Target based on evaluation of potential suppliers. General expertise in thermal management systems.
3 Name	Independent Consultant (2015-present), Former EMI Materials Engineer/Subject Matter Expert. (2006-2015), Former Materials Development Engineer . (2004-2006)	Competitor to Target - Thorough knowledge of Target through investigating them as both a competitor and potential supplier.
4 Name	Former Business Unit Manager at Aerospace Corporation (2011-2016)	Aerospace Customer of Target - Used Target as a supplier on multiple occasions for components such as pumps and valving, typically only using off the shelf products.

During 2 weeks, 8 customers and other Target experts were identified and interviewed (2/2)

Name	Key Job Title(s)	Comments
5 Name	Aerospace Consulting (2018-present), Former VP Business Development and Strategy at Aerospace, Inc. (2011-2014), Business Development, (1987-2007)	Commercial Partner with Target - Knowledge of Target from working with them as partner on losing bid to provide systems to the Boeing 787.
6 Name	CEO at Decisive Management Professionals International, LLC (2004-present), Former Director of Targeting and Combat Assessment (2000-2004), Former Commander/Staff Officer (1980-2000)	Defense Consultant - Deep knowledge of Target in the space and defense sectors, primarily from consulting to Defense Department organizations on multiple programs
7 Name	President of Consulting (2017-present), Former Director of Global Channel Sales, (2015-2017), Director of Sales (2003 – 2013)	Director of Sales, Competitor - Good knowledge of Target from his work in thermal management (primarily on materials), familiar on both military and commercial sides.
8 Name	Owner at Management Consultants LLC (2016-present), Former Executive Director, International Programs (2008-2014)	Defense Customer - Source selection authority for an ECU purchased by his company to cool the mission avionics in a tactical pod for the F-15, with Target as bidder

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Overall Target is viewed as a niche and highly capable provider of thermal management products in the liquid cooling space

Target Perceived Overall Strengths and Weaknesses

Reported Strengths

- Experts stated that Target has high design engineering capabilities
- Experts stated that Target had high quality products
- Target's reputation of being easy to work with was referenced by several experts
- Several experts mentioned that Target has built strong relationships with military and space program offices

Weaknesses

- Most experts spoke to Target's small size a potential limiting factor
- Experts stated that Target had a limited product offering, in that they did not extend much beyond liquid cooling products
- The key expert on the 787 felt that Target had a lower visibility in the commercial market

Experts thought that Target has been able to keep its core legacy strengths in quality and engineering, while making significant progress to overcome historical weaknesses as they moved into higher volume programs

Opinions on Target were overwhelmingly positive, weaknesses lied in small size, limited offerings and visibility



Strengths

High Design Engineering Capabilities

- "I think that Target is now positioned to start moving beyond the competition just because they are more involved with the high-end research and development activities" (Defense Consultant)
- "From what my team had told me at the time, they had really good engineering and, and done good work on closed-loop cooling systems" (Commercial Partner with Target)

High quality products

- "Target's quality is better than average the best of the best get into this space" (Sales Director at Competitor Company)
- "I think if they're not leading the charge on quality, I think they're doing well" (Commercial Customer of Target)

Easy to Work with

• "They have a good reputation for being on time, on-target, quality meeting all the specifications that were promised." (Defense Consultant)

Strong Relationships with Military and Space Program Offices

 "Target's Design has been very good at creating relationships with key customers in the commercial and military space." (Sales Director at Competitor)

Weaknesses

Small Company Covering Niche Vertical

• "Their reputation is good but again, it goes back to it's not large scale. They're in a very niche market" (Sales Director at Competitor)

Limited Product Offering

- "Target's Design is fluid distribution; they don't deal with materials" (Sales Director of Competition)
- "I typically wouldn't go to Target for a customized anything, I would, if they had it on the shelves but it was priced right, I would buy it as just the supplier" (Aerospace Customer of Target)

Lower Visibility in the Commercial Market

 "They suggest they've been in this game for a long time, but they've been there on the fringe for a while. The first I've heard of them was when they started working with on the 787" (Commercial Customer of Target)

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Experts viewed Target's product quality as a clear leader in the market

- Target's experience in space programs was cited as evidence of their ability to build high quality products
- Experts stated that Target's perceived product quality was above average or better in a demanding industry
- One expert offered that he had never heard of a quality issue with a Target product
- Strict attention to detail was mentioned as a key factor in high quality

Opinions on Target's quality were universally positive, supported by a variety of comments



Quality Strengths

Space History

- "In space-based satellite systems, integrated pump units were a key element" (Defense Consultant)
- "My sense is that they've done well in space, they've got a good reputation." (Sales Director at Competitor)

Above Average Quality

- "Target's quality is better than average the best of the best get into this space" (Sales Director at Competitor Company)
- "I think if they're not leading the charge on quality, I think they're doing well" (Commercial Customer of Target)
- "I would say that they're as good, or a little bit better than typical applications" (Aerospace Customer of Target)

No Reported Issues

• "So far, they haven't had a design issue or a quality issue that I know of after they delivered a product." (Defense Consultant)

Strict Attention to Detail

• "Another major, the most impressive one for me is their sealing system. They did a very good. They claim they can reach the zero leaking. That's very impressive. There are lots of details here. How to choose the proper harness, the materials, etc. Actually, they did a good job on all these details." (Competitor to Target)

Engineering Perceived Historical and New Strengths

Reported Historical Strengths

- Space legacy is believed to give them unique capabilities, e.g.
 - Extreme awareness of weight and size (ever-increasing requirements in all aviation applications)
 - Highly EMI/EMC compliant designs
- Core engineering very strong was generally viewed as strong throughout Target's history, e.g.
 - Technical competency
 - Proprietary technologies
 - Meet specifications and promised timing

Reported Current Strengths

- Recent focus on Lean engineering is believed to improved Target's engineering capabilities, e.g.
 - Overall engineering costs reduced
 - More products are viewed as commercial off-the-shelf (COTS)
 - Standard designs reducing perceived risks
- Target was cited as having Increased coordination with Military Research Labs, and is perceived to reaping benefits such as:
 - Building reputational standing with program teams
 - Increasing likelihood of design requirements fitting Target capabilities
 - Gaining better visibility into upcoming engineering requirements

Historic Strengths

Lean Engineering

Space Legacy Capabilities

- "I think one of the things that helps Target is that they are very conscious of weight because they work so much with NASA and in the space programs and weight is everything in satellites" (Defense Consultant)
- "One of the areas that Target is very strong in is that the components that they build are very EMI, EMC-hardened. It's the materials that they use. It's the tightness of the seals and seams, so they don't bleed" (Defense Consultant)
- "They have invested a lot of energy into lean engineering and I think that's paying off." (Defense Consultant)

Current Strengths

- "The 787 has probably helped them get some parts of their cost under control" (Commercial Customer of Target)
- "They were trying to do off the shelf subsystems. So, making pumps in a range from certain pressures or certain displacements, so they would have a family of pumps" (Aerospace Customer of Target)

Core Engineering Capabilities

- "Target was one of the primary suppliers of valving and pumps because of their experience and knowledge in the industry." (Aerospace Customer of Target)
- "Absolutely. I think they had a lot of technical competency." (Commercial Partner to Target)
- "They are innovative because they've got this secret sauce." (Commercial Customer of Target)
- "They're strong in design. They're decent at keeping their schedules. Their quality is very good. They solved an important problem." (Commercial Customer of Target)

Coordination with Defense Labs

- "Target's Design has been very good at creating relationships with key customers in the commercial and military space" (Director of Sales, Competitor)
- "I think that they've got, in the last three years, they have built those relationships with the Air Force research lab, the Navy research lab that get them on the inside to anticipate new requirements and to be part of the standard writing process which sets them up to be more competitive in the defense market." (Defense Consultant)

Target is viewed as previously having high prices but now priced more competitively

Pricing / Costs

Previous Weaknesses

- Cost structure were believed to previously be high, primarily because
 - High engineering content driving high development costs
 - Small scale assembly not suited to efficiency
- Pricing was cited as previously high
 - Did not match competition
 - Viewed as subjectively high

Current Strengths

- Higher volumes allowed for increased efficiencies in manufacturing and assembly, reducing costs
 - Focus now on repeating processes
 - Ability to identify and drive efficiencies
- Recent focus on Lean engineering reduced engineering hours required
 - Increased standardization of designs (e.g. COTS)
 - Reuse of designs by adapting existing designs vs all-new
- Adjusting pricing to high volume, multi-year programs
 - Willing to take lower first unit pricing to win programs
 - Understanding margins are achieved overtime on typical programs

While higher previous cost/prices were sometimes mentioned, current cost/price were viewed as competitive

Previous

Previous Costs

- "They may be a little bit high in costs is kind of the overall positioning" (Commercial Customer of Target)
- "So they had the fundamental technologies, in certain products, but they were going to obviously have to be redesigned." (Commercial Partner to Target)

Previous Prices

 "Target's technological advantages were not significant enough to outweigh business advantages of a competing proposal. Target did not understand how to price to win defense proposals at the time (2005)" (Defense Customer of Target)

Current

Current Costs

- "They had to change their manufacturing costs, set up a manufacturing process that is repeatable in the last three years" (Defense Consultant)
- "The 787 has probably helped them get some parts of their cost under control" (Commercial Customer of Target)

Current Prices

- "Target I think now understands that, that it's best to come in with a low price on the acquisition program and then make your money once the program transitions to sustainment." (Defense Consultant)
- "I would, if they had it on the shelves but it was priced right, I would buy it as just the supplier." (Aerospace Customer of Target)
- "Target's price curve has bent significantly in the last three or four years and they've become more competitive in that aspect." (Defense Consultant)

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Experts' opinions on Target's experience in Space were limited, but those who could speak to it stated that Target is a clear leader in Space

- Only one of the experts had direct experience with Target on Space programs
- One other experts mentioned that Target was on Space programs
- Target's heritage in the Space industry was cited as a strong influence on the capability of Target for weight and EMI

Experts generally were aware of Target's presence in Space and had a positive impression



Quality Strengths

Direct Experience

• "I've evaluated Target mainly with space programs, though I've also done some work with them on defense aerospace." (Defense Consultant)

General Awareness

• "My sense is that they've done well in space, they've got a good reputation." (Sales Director at Competitor)

Reputational Advantages

- "I think one of the things that helps Target is that they are very conscious of weight because they work so much with NASA and in the space programs and weight is everything in satellites" (Defense Consultant)
- "One of the areas that Target is very strong in is that the components that they build are very EMI, EMC-hardened. It's the materials that they use. It's the tightness of the seals and seams, so they don't bleed" (Defense Consultant)

Target is largely viewed as a well positioned leader in military/defense

Improvements discussed before were viewed key enablers to successful higher volume programs

- M109 Howitzer and upgrade to F/A-18 were mentioned as example successes
- Manufacturing was believed to be moved to more repeatable processes
- Products that can be called COTS (commercial off the shelf) were mentioned as having been developed and were thought to increase appeal to acquisition organizations

Relationships with Defense Research Labs were stated as a strength of Target

- Viewed as very helpful in setting early designs and specifications
- Time spent at labs make them a know entity, and likely to be recommended as supplier
- Early involvement gives Target increased lead times on what future requirements will be

Target's core capabilities position it well for the future

- Defense likes to pursue high technology, and Target is viewed as high tech
- Active/Passive stealth will be more important on future programs (e.g. F-35 and B-21) and Target's demonstrated strength in EMI/EMC should prove to be valuable

Space Defense Aerospace

Experts cited positive observations on Target's positioning in military/defense

Positioning in Military/Defense

Relevant improvements

- "Integrated pump units were a key element and aircraft systems, liquid cooling systems as well as M109 Howitzer and the F/A-18 upgrade." (Defense Consultant)
- "They had to change their manufacturing costs, set up a manufacturing process that is repeatable in the last three years. " (Defense Consultant)
- "Time to time they were a supplier to us, so we would acquire pumps and valving to complete our system. It was really based upon the application." (Aerospace Customer to Target)
- "Target is to the point where they're ready to have in essence a COTS offering." (Defense Consultant)

Relationships with Defense Labs

- "They have, in essence, figured out how to play in the space, be good stewards and good team players." (Defense Consultant)
- "Target's Design has been very good at creating relationships with key customers in the military space." (Sales Director at Competitor)

Core Capabilities

- "Target met all the specifications on size, weight, and power on the ECU to cool the mission avionics in a tactical pod for the F-15" (Defense Customer to Target)
- "I think one of the things that helps Target is that they are very conscious of weight because they work so much with NASA and in the space programs and weight is everything in satellites" (Defense Consultant)
- "One of the areas that Target is very strong in is that the components that they build are very EMI, EMC-hardened. It's the materials that they use. It's the tightness of the seals and seams, so they don't bleed" (Defense Consultant)

Most experts cited a positive experience with the Boeing 787 program

- Target's commercial customer believed they had little experience or presence in the commercial aerospace industry prior to the 787
- An expert from Honeywell spoke to engaging Target as part of a team on a losing bid to provide a set of mechanical systems to Boeing for the 787
 - He stated that Target was to provide boot strap reservoirs and accumulators to go with Honeywell pumps and heat transfer/exchangers
- The expert from UTC/Collins described a positive experience with Target on their Boeing 787 program
 - He stated Parker Aerospace was tasked with providing the thermal cooling systems
 - He said that he and his team believed that the cooling system could be designed using conventional approaches, but underestimated the cooling challenges of the increased electrical content
 - He said that Target was able to solve what had been a huge problem on the 787 with the thermal cooling system

Two of the experts spoke to Target and the Boeing 787



Quality Strengths

Commercial Experience

• "They suggest they've been in this game for a long time, but they've been there on the fringe for a while. The first I've heard of them was when they started working with on the 787 " (Commercial Customer of Target)

Honeywell Failed 787 bid

• "Target had some bootstrap reservoirs that Honeywell didn't have, and accumulators, and several other different components that we were not working with at that time, for closed loop cooling" (Commercial Partner to Target)

UTC/Collins and Target on 787

- "So, in actuality, Target's Design Technologies ended up saving the day for us, in many ways. They kind of solved the problems we had, and came up with some pretty good solutions
- The bootstrap reservoir sort of became theirs, or had become, their claim to fame. It's kind of a unique piece of equipment. And they have their own spin on it. So, I believe that, again I say they are a special sauce, because I don't know what it is. Their design capability, when it comes to accumulators and pumps, seems to be superior to at least other competitors." (Commercial Customer of Target)

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Experts stated that their purchase selection criteria included cost, quality, and prior relationship

Selection Criteria

- One expert, who was an engineer, stated his criteria were
 - Design capability
 - Quality
 - Cost
- Other experts described a more business/purchasing focused perspective, e.g.
 - Cost (most important criteria)
 - Meets requirements (e.g. certified, can meet specifications ticket to entry, not a differentiator)
 - Prior experience (to get on bid list) new companies considered if prior suppliers no longer available or prior suppliers had problems

Source: xxx

Future trends were mentioned as mostly favorable to Target

Future Trends

Favorable Trends Mentioned

- Military aircraft are expected have increasing amounts of high heat creating electronics, requiring higher density cooling systems
- Commercial aircraft are expected to have more electrical systems like the 787, requiring more sophisticated cooling systems
- One expert expected to see many new smaller producers of all electric aircraft such as Zunum and Wright Electric, creating similar cooling needs
- Blackbox designs are expected to be adopted in military aircraft containing complete systems will likely require a liquid cooled container

Less Favorable Trends Mentioned

- Growth in other technologies were thought to be possible, such as
 - Materials based heat management
 - Movement away from mechanical systems in general (such as liquid cooling systems)
 - Growth in technologies not core to Target (e.g. air and vapor cycle)
- One expert stated that a desire to have suppliers provide more complete systems than Target can provide at this time

Source: xxx

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Interview Quotes (1/3)

Former Director of Engineering

- They suggest they've been in this game for a long time, but I think they've been there on the fringe for a while. Their big foray into the big aerospace was probably their work on the 787
- So, in actuality, Target's Design Technologies ended up saving the day for us, in many ways. They kind of solved the problems we had, and came up with some pretty good solutions
- The bootstrap reservoir sort of became theirs, or had become, their claim to fame. It's kind of a unique piece of equipment. And they have their own spin on it
- So, I believe that, again I say they are a special sauce, because I don't know what it is. Their design capability, when it comes to accumulators and pumps, seems to be superior to at least other competitors
- I think they have, the 787 has probably helped them get some parts of their cost under control. They are innovative because they've got this secret sauce
- I think they are strong at designing their product. I think they are pretty good with maintaining their schedules that they define
- They're strong in design. They're decent at keeping their schedules. Their quality is very good. They may be a little bit high in costs is kind of the overall positioning, but they solved an important problem
- Manufacturing. I'm going to guess that they do certain things in-house. But, it looks to me like their stuff is unique enough that they make much of it in-house. Certainly they assemble it in-house
- I think if they're not leading the charge on quality, I think they're doing well
- If they could leverage what they've learned on the 787, and then expand their product line a little bit, take a few more components, I think they could really grow
- The first I've heard of them was when they started working with on the 787

Former Principal Engineer, Certification

- Target, one of their big things is valves currently. So they do valves, and they do heat transfer work. They have engineers, and it's a small business
- · They have a United Technologies Corporation's Flier Gold Award for outstanding performance. And Boeing likes to see that kind of thing

Interview Quotes (2/3)

Former Thermal Management for Competitor

- · For example, basically for the Target, they are working more like a liquid cooling system. Their major product is a heat pump
- · Their major part is cycling. The pump. They're working very good. Yeah, they provide the good product for that
- Another major, the most impressive one for me is their sealing system. They did a very good. They claim they can reach the zero leaking. That's very impressive
- There are lots of details here. How to choose the proper harness, the materials, etc. Actually they did a good job on all these details. They have some good thinking about the whole system

Business Unit Manager

- Time to time they were a supplier to us, so we would acquire pumps and valving to complete our system. It was really based upon the application
- · Target was one of the primary suppliers of valving and pumps because of their experience and knowledge in the industry
- They were trying to do off the shelf subsystems. So, making pumps in a range from certain pressures or certain displacements, so they would have a family of pumps
- I typically wouldn't go to Target for a customized anything, I would, if they had it on the shelves but it was priced right, I would buy it as just the supplier
- I would say that they're as good, or a little bit better than typical applications

Program manager on mechanical systems bid to Boeing 787, Commercial Partner

- Target had some bootstrap reservoirs that Honeywell didn't have, and accumulators, and several other different components that we were not working with at that time, for closed loop cooling
- Absolutely. I think they had a lot of technical competency. And from what my team had told me at the time, they had some really good engineering and, and done some good work on that side of the closed-loop cooling systems, in this case
- So they had the fundamental technologies, in certain products, but they were going to obviously have to be redesigned
- They do have some proprietary technology of their own. I really don't think I can be more specific than that
- So they can do partial, but they can't do the complete. They can do subsystems.

Interview Quotes (3/3)

Defense Department Consultant, Retired Army Acquisition Officer

- · When it comes to large scale thermal management, i.e. cooling systems, Target is one of the leaders in the market
- I think that Target is now positioned to start moving beyond the competition just because they are more involved with the high-end research and development activities
- Target's price curve has bent significantly in the last three or four years and they've become more competitive in that aspect and they're making the right relationships.
- they have invested a lot of energy into lean engineering and I think that's paying off
- Target is to the point where they're ready to have in essence a COTS offering
- I think one of the things that helps Target is that they are very conscious of weight because they work so much with NASA and in the space programs and weight is everything in satellites
- Target I think now understands that, that it's best to come in with a low price on the acquisition program and then make your money once the program transitions to sustainment
- They're commercializing their capability rather than having to build a completely new spec item every time something rolls out the door
- They had to change their manufacturing costs, set up a manufacturing process that is repeatable in the last three years
- I think that they've got, in the last three years, they have built those relationships with the Air Force research lab, the Navy research lab that get them on the inside to anticipate new requirements and to be part of the standard writing process which sets them up to be more competitive in the defense market
- They've got in essence NASA's star of approval for developing this technology (liquid-cooled black box)
- One of the areas that Target is very strong in is that the components that they build are very EMI, EMC-harden It's the materials that they use. It's the tightness of the seals and seams. ed so they don't bleed
- They have a good reputation for being on time, on-target, quality meeting all the specifications that were promised. They have, in essence, figured out how to play in the space, be good stewards and good team So far, they haven't had a design issue or a quality issue that I know of after they delivered a product. players and that goes a long way
- At the heart of this thing, they are a science and engineering company. Most of their employees enjoy the challenge of developing a high-end system and having to meet a long laundry list of potentially competing specifications because at their heart they're a bunch of scientists. I think they've had to put a lot of effort into lean manufacturing over the last three years because typically scientists aren't predisposed in that direction, but they have in essence turned that curve and simultaneously built those relationships that they need to expand their footprint inside of defense
- I think that companies like Target that are very technology-oriented are the future of aerospace and defense

Interview Quotes (3/3)

Director of Sales for Competitor

- Target is primarily involved with liquid thermal cooling systems, and then some of the component pieces with the pumps and the accumulators and those kinds of things
- Target is in a pretty small niche but it's a very good one
- · Target's Design has been very good at creating relationships with key customers in the commercial and military space
- 70% of the time what they're being asked for, they (Target) probably have something similar
- My sense is that they've done well in space, they've got a good reputation.
- Target's Design is fluid distribution, they don't deal with materials
- They're not a leading innovator, but they're not the fast follower
- Target's quality is better than average, but the best of the best get into this space
- Their reputation is good but again, it goes back to it's not large scale. They're in a very niche market

Former Executive Director, International Programs

- Target met all the specifications on size, weight, and power on the ECU to cool the mission avionics in a tactical pod for the F-15, but Fairchild Controls offered a better overall pricing package
- Target's technological advantages were not significant enough to outweigh business advantages of a competing proposal
- Target did not understand how to price to win defense proposals at the time (2005)
- I think their experience in