

## **Apollo 13 – 50 Years Since NASA's Greatest Innovation Moment**

By Len Ferman

In normal times, most companies recognize that delivering an outstanding customer experience is a major factor in both customer retention and overall company success. During a crisis understanding the customer experience can become downright critical.

In this article we will look in depth at customer experience problems and solutions during a crisis through two stories. One story that took place 50 years ago this week and one that is currently taking place amid the current COVID-19 crisis.

### **APOLLO 13**

This week marks the 50<sup>th</sup> anniversary of the Apollo 13 mission. It was slated to be the third landing on the moon. But on the third day of the outward journey, on April 13<sup>th</sup>, 1970, an explosion occurred in the oxygen tank, crippling the spacecraft while it was 200,000 miles from Earth. A moment later commander Jim Lovell called mission control and reported, "Houston, we've had a problem."

25 years later, during the making of the movie, "Apollo 13", director, Ron Howard, altered one word of that sentence to increase the drama. Actor Tom Hanks, who portrayed Lovell, uttered the now iconic phrase, "Houston, we have a problem."

**See the scene from the movie "Apollo 13" here:** <https://youtu.be/C3J1AO9z0tA?t=11>

Abruptly the mission changed from that of lunar exploration to one of basic survival.

And suddenly, Apollo 13, which had been up to this point been ignored by the general public, as another routine trip to the moon, became a crisis followed intently worldwide over several nail-biting days.

The front page of the New York Times, on April 15, 1970, read: "All around the world yesterday, during the Apollo 13 emergency, there was a surge of interest in the flight. And there were prayers and anguish." In Paris, Le Monde wrote: "The whole human race is participating with them in the agony of their return."

The parallels abound with the current COVID-19 crisis. All humankind is experiencing the current crisis together, just as the whole world followed the newscasts as the lives of the astronauts were in peril 50 years ago. Each of these situations represents a worst case "customer experience" nightmare. And each required quick thinking and innovation to begin to solve a myriad of problems. In the current case the problems are not yet solved, but many are working on them non-stop.

## The Astronauts Lives are in Jeopardy

"All the News  
That's Fit to Print"

# The New York Times

**LATE CITY EDITION**

Weather: Cloudy today. Cloudy and cool tonight. Fair, mild tomorrow. Temp. range: today 52-61; Monday 61-62. Full U.S. report on Page 55.

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## POWER FAILURE IMPERILS ASTRONAUTS; APOLLO WILL HEAD BACK TO THE EARTH

### LINDSAY PROPOSES REALTY TAX RISE AND HIGHER FEES

Explains in TV Talk How He  
Seeks to Close Budget  
Gap of \$630-Million

By MARTIN TOLCHIN  
Mayor Lindsay proposed an unspecified increase in real property taxes and city fees last night in a televised "Message to the People" in the fiscal plight of the city.  
The proposals were the latest in a series offered by the Mayor to close what he called a "gap between income and ex-

### Legislature Votes That Credit Cards Must Be Requested

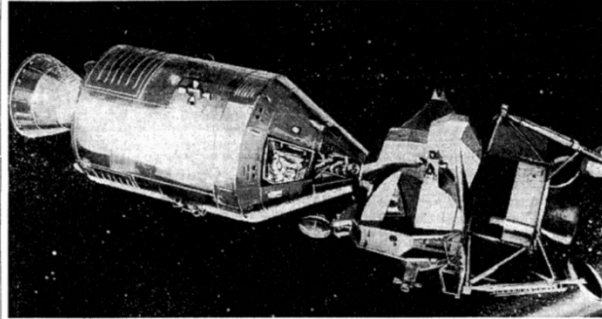
By FRANCIS X. CLINES  
Special to The New York Times  
ALBANY, April 13—The State Senate voted final legislative approval today of a bill that would prohibit the mailing of credit cards to the public unless they were requested specifically in writing.

The measure, which was passed unanimously, was sent to Governor Rockefeller after numerous legislators complained of pretest conditions in which cards were sent out blindly and frequently misused.  
A second credit-card measure was approved by 29 to

### BREZHNEV URGES FRESH SOLUTIONS TO ECONOMIC ILLS

On TV, He Strikes Out at  
Low Productivity of Labor  
and Poor Management

By BERNARD GWETZMAN  
Special to The New York Times  
MOSCOW, April 13—Leonid Brezhnev, the Communist party leader, told the Soviet people today that "new methods and new solutions" were needed



### NO MOON LANDING

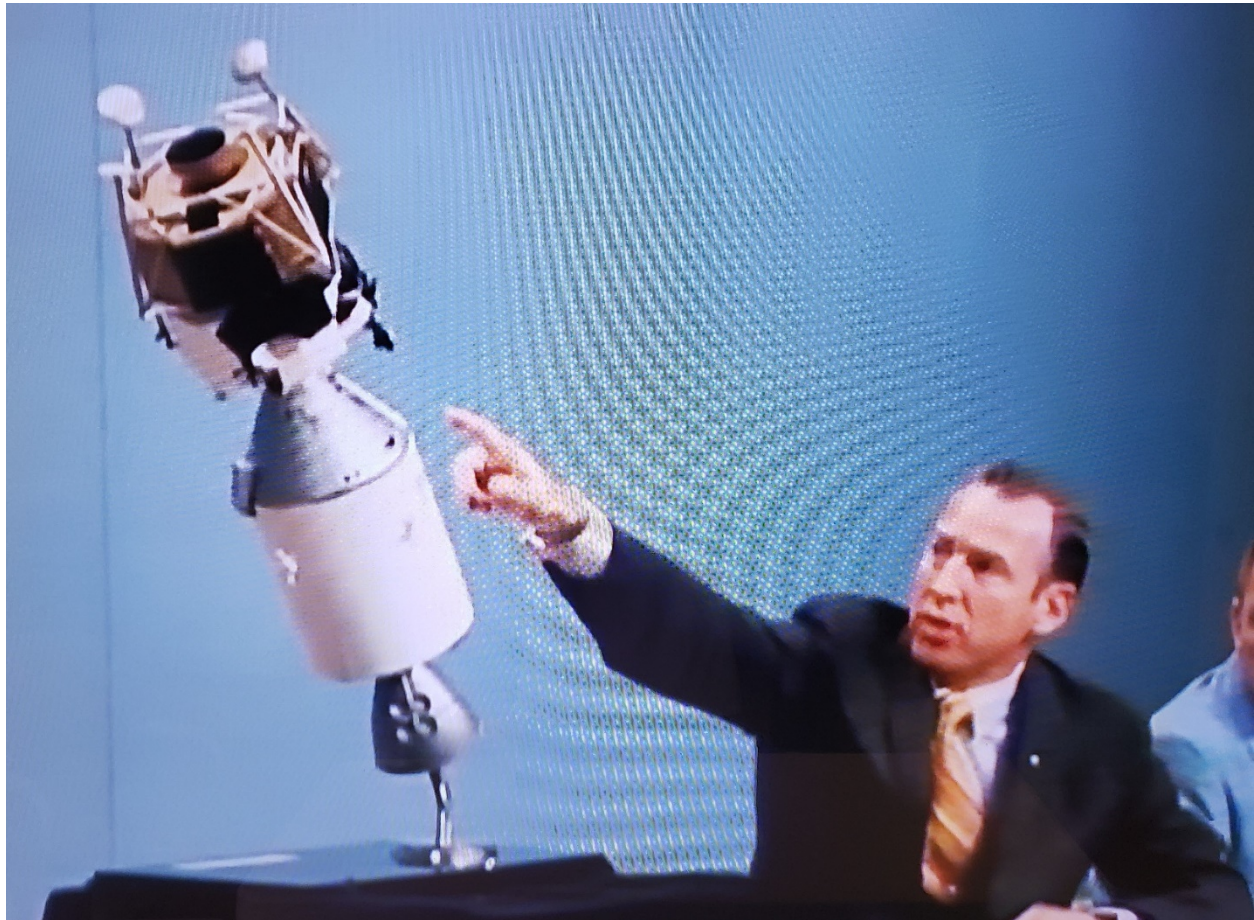
Men Leave Main Craft  
for 'Lifeboat' After  
an Oxygen Leak

Excerpts from conversations  
with spacecraft, Page 32.

By JOHN NOBLE WILFORD  
Special to The New York Times  
HOUSTON, Tuesday, April 14  
—The Apollo 13 astronauts, their lives threatened by a serious oxygen leak, were forced to evacuate their command ship into last night and use their intended moon-landing craft as a "lifeboat" for a fast return to the earth.

Shortly after the explosion, the initial situation was bleak for Apollo 13. Some experts back on Earth pegged the probability at just 10% of saving the astronauts. The three men were inside the command module, which was designed to house them for the long trip to lunar orbit and back home. Their oxygen came from the service module which was attached to the back of the command module. It contained the engine and all the primary support systems. But oxygen was now venting into space from the damaged service module whose side had been blown off. Power and water were generated in the service module by mixing oxygen with hydrogen. Without the main oxygen tanks all the basic elements needed to sustain life in the command module would soon be completely depleted, except what had to

be held in reserve for the final re-entry to Earth if the astronauts could make it back to that point.



**Apollo 13 Commander Jim Lovell Describes the three parts of the spacecraft at the post flight press conference**

Because the explosion had occurred on the way to the moon the lunar module was still attached to the front of the command module. This awkward looking machine, known as the “LEM”, didn’t even have seats inside. It was designed for the specific purpose of transporting the astronauts the last 60 miles to moon’s surface and back up to the command module that would be orbiting the moon. The LEM was also not designed to return to Earth. Its thin walls were only about four times as thick as the outside of a soda can. It would burn up if it attempted to re-enter the Earth’s atmosphere.

As the crisis unfolded, NASA was faced with the need to innovate to solve several seemingly impossible problems to bring the astronauts safely home. Fortunately, NASA had created an outstanding culture of innovation which had culminated in the successful lunar landing and Neil Armstrong’s first steps on the moon 9 months before. Apollo had already been proven to be successful at the most ambitious innovation project in human history.

Gene Kranz, mission control flight director, was the epitome of the innovative leadership at NASA. He said that “success would only come as a team, so we became one, and we learned to check our egos at the door.” At the onset of the crisis, Kranz spoke to his team saying, “Let’s everybody keep cool... Let’s solve the problem, but let’s not make it any worse by guessing... what I want from every one of you is simple – options, and plenty of them.” Kranz was practicing open innovation, in which everyone associated with the program could freely share ideas.

Another testimony to the innovative culture at NASA was the fact that during a mission the flight director had the final say on all major decisions, not his superiors or the upper level NASA administrators. Even in the middle of the crisis, when three of his superiors came to his console, each with a different idea of which of things needed to be done next, Kranz listened to their ideas and was free to say, “Gentlemen, I thank you for your input. The next job for this crew will be...” and he told them in what order their ideas would be implemented.

Mission Control was able to quickly determine that the LEM had not been damaged in the explosion. As a result, they quickly implemented a plan that gave the LEM a new purpose for which it was never intended. The LEM would now serve as a lifeboat in space. There was no choice but for the astronauts to shut down the command module, saving it for later Earth re-entry, and move to the LEM for almost entire duration of the trip. If they made it back to Earth orbit, at the last moment the astronauts would have to re-enter the command module, start it back up and plunge down towards the Pacific Ocean.

As soon as the astronauts moved into the LEM they had an array of critical problems that needed to be solved. From a customer experience point of view, none was about to be more important than breathable air. If you can’t breathe you have no chance of survival. While the LEM had its own supply of oxygen, enough to make it back home, it did not have enough capability to scrub the carbon dioxide from the air that three men would create during the four days to get home. Their air was growing toxic and would become lethal long before splashdown if nothing was done.

Ed Smylie was responsible for the development of life support systems for Apollo 13. He was one of many hundreds of heroes of the rescue that worked almost round the clock outside of the limelight of mission control. But he perhaps deserves the most credit of any individual. When the astronauts had to abandon the command module and move to the LEM he immediately recognized that carbon dioxide was going to become a problem. He also knew that the cartridges used to scrub carbon dioxide from the command module were not compatible with the LEM and that a solution would need to be improvised soon. Smylie went to work and developed a prototype using materials he knew were available to the astronauts. He then had the device tested in a vacuum chamber and produced directions for how the crew could make the device. In turn these instructions were relayed up to the crew which proceeded to make and install the “homemade” scrubbers.

Smylie’s success was reported in the New York Times on April 15, 1970, but without giving him the credit by name. The Times wrote about the dire situation with the scrubbing of the carbon dioxide as follows, “A homemade device for doing this was designed quickly and put together here by technical advisers to the flight just to prove it could be done. All the parts they used were things that would be available in the spacecraft.” This was a classic case of innovating by first conceiving a solution, then creating and testing a prototype.

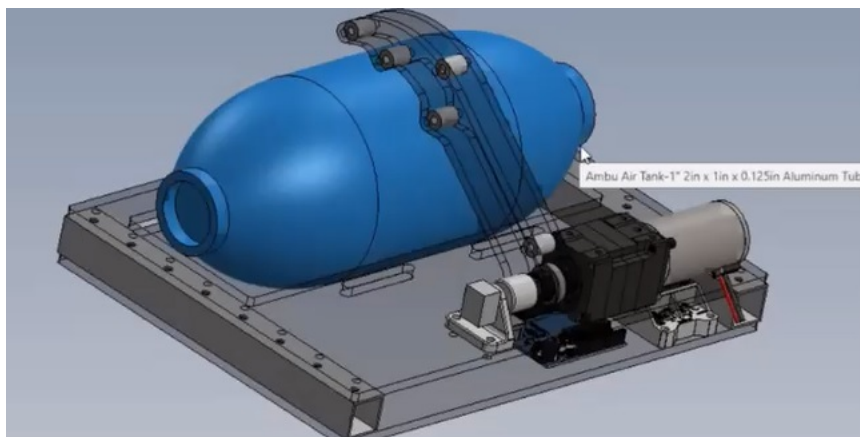
The story of the carbon dioxide problem and the “off the shelf” solution were dramatically portrayed in the movie “Apollo 13” in this scene:

<https://www.youtube.com/watch?v=1cYzkyXp0jg>

While there were other customer experience issues, such as the near freezing temperatures in the spacecraft. And ensuring the crew had enough sleep to be able to function when asked by mission control to execute life-saving spacecraft maneuvers. But perhaps no other single moment of truth during the crisis was greater than seeing the movement on the carbon dioxide monitor after the improvised scrubber was installed by the astronauts.

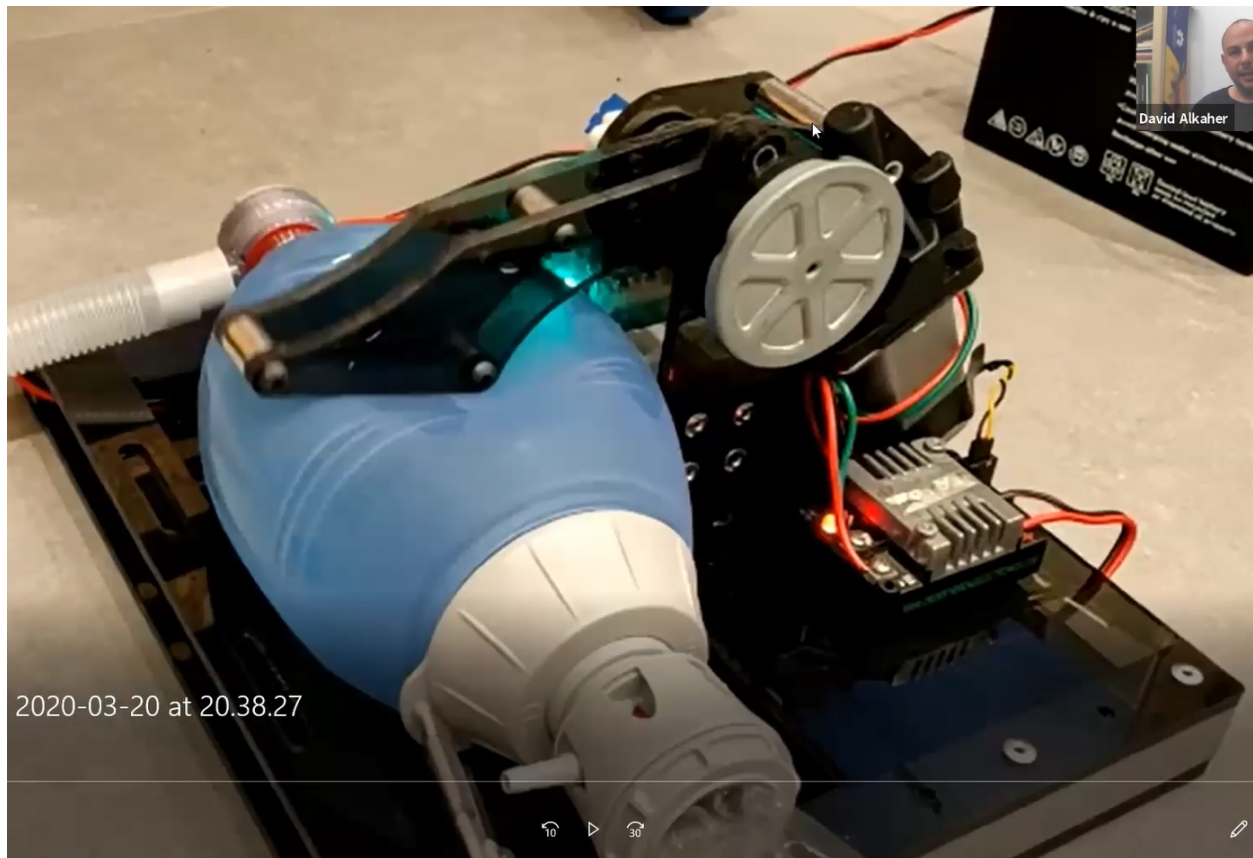
One of the most important problems Apollo 13 had is similar to a problem thousands of people in hospitals are suffering from with COVID-19 right now – the inability to breathe. Last month David Alkahar, head of innovation for the Israel Air Force, thought of the inspirational story of the Apollo 13 carbon dioxide scrubbers. He realized he might be able to facilitate the solving of one of the most pressing problems in the current crisis by replicating Ed Smylie’s sensational effort. Alkahar believed that ventilators, the machines necessary to keep ICU patients breathing, could be made from “off the shelf” parts just as Smylie had created the carbon dioxide scrubbers 50 years ago.

Alkahar leveraged his vast network of innovators to assemble a large group with expertise across a wide range of fields including electronics experts, robotics specialists, and medical professionals. He split them into teams and tasked them with the objective to develop a prototype for a low-cost ventilator. Alkahar tried an interesting innovation technique in which he split up the large group into three teams that each tried to tackle the problem via ZOOM video conferences. The team that Alkahar led met for 6 hours and by the end of the call they had come up with a CAD design pictured below.



The other teams that had worked on other ideas then helped critique and improve the CAD design put forth by Alkahar’s team. One day later Alkahar’s team created a physical prototype of a working ventilator using re-purposed parts from a recent robotics competition machine as seen in the picture below.

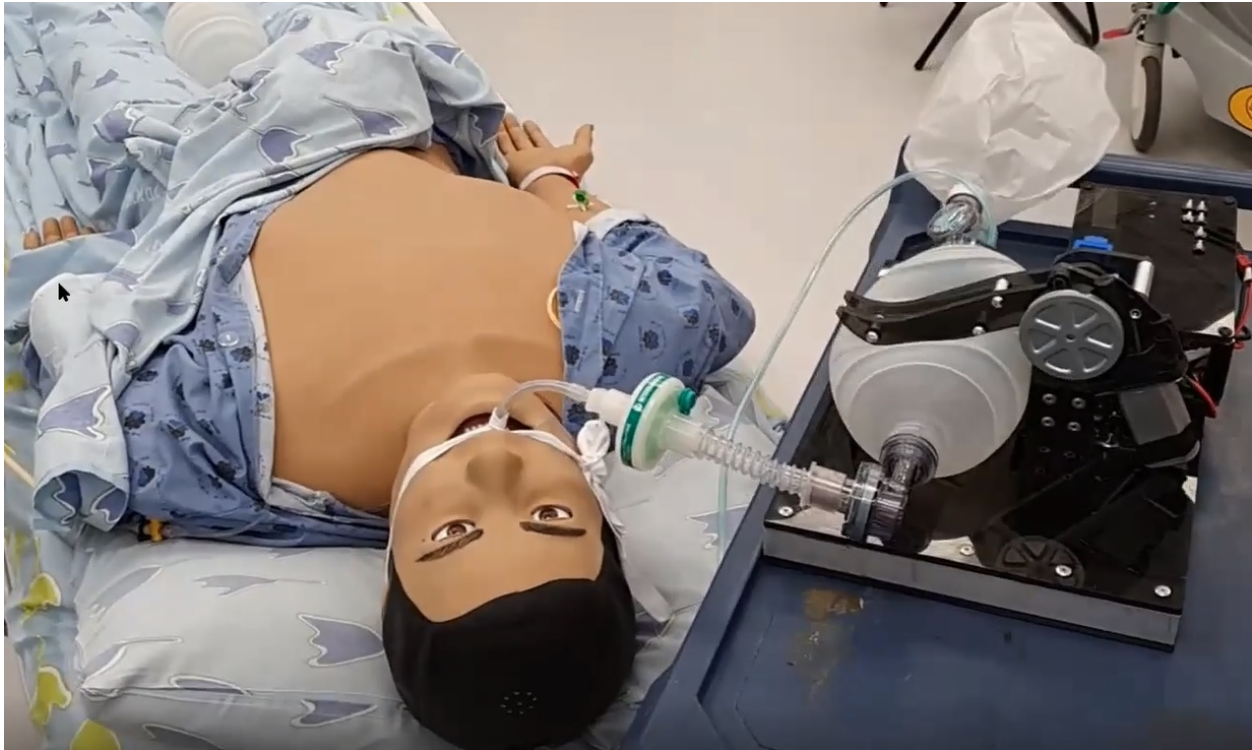




Alkahar also lined up resources from Mogen David, the Israeli Red Cross, to test the ventilator on a human puppet and the ventilator worked perfectly.



And one day later Alkahar submitted the prototype to an Israeli hospital to test on their equipment and show it to the doctors.



Alkahar's team has named their invention the Ambovent. They are not seeking to produce and sell the ventilators for profit. Their goal is simply to help solve a part of the worldwide crisis by enabling ventilators to be mass produced at a low cost. As a result they have published all of their plans on a website for free use by other teams around world.

The plans can be found at this website:

<https://members.smoove.io//view.ashx?message=h44820433012234054102196540122410347&r=1009>

They have also sent the plans to the World Health Organization in the hopes that clinical trials may be conducted on the Ambovent ventilator.

Many developing countries have few or no ventilators at all. It is possible that the Ambovent ventilator may soon save lives soon after clinical trials lead to their approval to use in hospitals.

Like NASA, David Alkahar is innovating to save lives by "working the problem" as Gene Kranz used to say. If he is successful in receiving approval for clinical use, his team's invention may be a game changer that improves the "customer experience" for patients and medical professionals that live in areas where hospitals don't have enough ventilators.

50 years ago and this week innovation is critical to improving the customer experience in a crisis. In both cases, the groups that seem to be successful are those that focus on continuous innovation as a best practice. Apollo 13 may have not succeeded in landing on the moon, but by demonstrating how mission control was prepared to innovate and solve a crisis, it may have been NASA's greatest moment.

Let's hope that more groups like David Alkahar's can step forward and help us innovate out of the current COVID-19 crisis and make our current time remembered for great innovations too.

#### **About the author:**

Len Ferman is a senior consultant with MaritzCX, an InMoment company. He developed the customer journey mapping service used by MaritzCX. He also leads engagements to develop customer journey maps as well as action plans and initiatives to design new and improved customer experiences.

Len is also an adjunct professor at the University of North Florida where he teaches a course that he developed on business creativity and innovation. His unique teaching methods were highlighted in a Forbes magazine article titled, "How to Prepare College Students to Innovate." In addition, he recently authored a college textbook, "Business Creativity and Innovation: Perspectives and Best Practices", that was published Cognella, and is in use at several universities and is available on Amazon.

Prior to joining MaritzCX, Len spent 25 years with Fortune 100 companies managing customer experience research and innovation. Len led the front end of innovation at Bank of America and served as head of ideation. He developed the Idea Tournament process to identify and select optimal concepts for development.

Len graduated from Duke University with an M.A. in Economics and an M.B.A.

#### **Sources**

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New York Times, April 14, 1970

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