# Learning Lessons From the Scrum Adoption in the Brazilian Air Force

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***This article shares the experience of Scrum adoption in a strongly hierarchical organization of the Brazilian Air Force. There is an apparent paradox between Scrum teams and groups formed by military personnel. Hierarchy is not exclusive to the military. The turning point to succeed was institutional support. This article also shares some good teachings from military pilots that helped to spread the Agile Culture. The main contribution is the learning lessons that may inspire other organizations to work with Scrum or Agile adoption. Once a strongly hierarchical organization has succeeded in its journey, why not others? The journey is still underway. While Scrum adoption became an Agile transformation, culture and mindsets are changing. The main goal is to turn the Brazilian Aeronautics Computing Center of São José dos Campos into a reference in Agile Methods within the Brazilian Air Force.***

Who knows a little about Scrum probably knows that one of its creators, Jeff Sutherland, was a fighter pilot for the United States Air Force (USAF) during the Vietnam War. Sutherland created Scrum years after the war, but several of his military experiences as a combat pilot contributed to this successful idea.[1]

Both Scrum and other Agile methods are focused on individuals and their interaction. Its basis is an environment where people are encouraged to work collaboratively to achieve a common goal that delivers value to the customer.[2]

Scrum teams are self-organized, meaning no one tells them how to perform their job. Besides, they are multifunctional, holding all the necessary skills to complete their work. The Scrum team model improves flexibility, creativity, and productivity.[3]

On the other hand, Armed Forces follow a strict command hierarchy between personnel, classified into military ranks grouped by authority levels.

Thus, a paradox is noticeable between Scrum teams and groups formed by military personnel. There is no hierarchy among members of a Scrum team and no one tells them how to work. But hierarchy, command, and control are rigid in groups of military personnel.

The Brazilian Aeronautics Computing Center of São José dos Campos [Centro de Computação da Aeronáutica de São José dos Campos (CCA-SJ)] is an organization of the Brazilian Air Force [Força Aérea Brasileira (FAB)]. Its mission is to develop and support software systems and flight simulators for the FAB.

As a military organization, the CCA-SJ follows a rigid command hierarchy, where software developers, computer engineers, system analysts, and all staff are military personnel.

A few years ago, the development teams adopted Scrum to develop software and flight simulators. In the beginning, some problems have arrived. Two years later, the adoption of Scrum at the CCA-SJ became a success story.

This article shares the experience of Scrum adoption in a strongly hierarchical organization, highlighting the learning lessons that may inspire other organizations to succeed with Scrum or other Agile adoptions. It also shares some teachings from Air Force pilots that helped spread the Agile Culture in the CCA-SJ.

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## FIRST ATTEMPTS WITH AGILE

Although there are no formal reports, prior Agile adoption attempts failed in the CCA-SJ and did not last long. They were naturally extinct over time, notably after those who had Agile initiatives left the organization.

The Scrum adoption got in the spotlight on the CCA-SJ, mainly after problems during the software development process. Some of these problems were related to communication between sectors of the organization in August 2017. Others were related to systems developed and maintained by the CCA-SJ in March 2018. All of them resulted in delivery delays and system malfunctions.[4]

When the organization started to support Scrum adoption, one of the main concerns was to prevent the adoption from failing again. To this end, the CCA-SJ designated a team to study what could have contributed to the previous failures.

The State of Scrum 2017–2018 addresses a possible answer, as a survey from more than 2000 active Scrum and Agile Practitioners of the Scrum Alliance membership base. This report presents the most topical findings for organizational leaders and practitioners wrestling with Agile transformations.[5]

Among the main challenges implementing Scrum in the first place comes: "organizational design and culture made it difficult to adopt and scale (51%)." It also shows that the main reasons causing tension between Scrum teams and organization are "adherence to top-down and command-and-control management approaches (64%)" and "resistance to change (63%)."

It is not a surprise why the CCA-SJ failed with Scrum. As a military organization, it follows a command-and-control structure. Hierarchy implies top-down management. Also, according to Schneider's Culture Model,[6] the culture that better fits the CCA-SJ is the control culture. Regarding resistance for changing, in this case, the humans do resist to change.[7]

## TURNING THE GAME AROUND

This section describes what most contributed to turning the game around and succeed with the Scrum adoption. The turning point to the success of this journey was the institutional support. It aligns with the State of Scrum, being the most important consideration when adopting Scrum, as an "active senior management and support (57%)."[5]

### Institutional Support

The institutional support began in March 2018, when there was an urgent need to take actions before the consequence of the mentioned problems become irreversible. The suggested solution was to form a Project Management Office (PMO) to standardize project-related governance processes and facilitate sharing resources, methodologies, tools, and techniques.

A previously published article describes the problems that led to creating a PMO at the CCA-SJ. It also lists the first steps of this office, the action plan drawn to mitigate the issues, the problem solving, and the first results.[4]

Another published article presents the main events that have arrived since the beginning of this successful journey at the CCA-SJ, including two cases of success.[8]

One of the two success cases was developing a flight simulator for the C-95 M aircraft with Scrum. This simulator was the first one built by one of the FAB organizations (see Figure 1).[9]

### Cycle of Ideas

After the first results, the institutional support became more consistent. With that, the PMO members started to submit articles and talks to conferences related to Agile. The feedback during conferences turned into a cycle of ideas that helped the PMO with its continuous improvements.

The Lean Inception adoption is an example of how the cycle of ideas has worked.

- IMPLEMENT—A PMO member learned about Lean Inception during a conference. His team implemented Lean Inception for project planning.
- TEST—The team got good results from Lean Inception.
- SHARE—That same PMO member presented results at another conference.
- FEEDBACK—Attendees, including the Lean Inception creator, gave feedback about the presented results.
- DISCUSS—PMO members discussed the given feedback and agreed to implement Lean Inception for other project plannings, completing the cycle (see Figure 2).

The Lean Inception is now the default project planning method in the CCA-SJ.

### Communicating

Communication is one of the most critical aspects for the success of any organization. The first problems issued by the CCA-SJ were related to communication.

**FIGURE 1.** First flight simulator built on the CCA-SJ for the FAB. This is the simulator for the C-95 M aircraft where the Scrum was used as the framework for development. (From Centro de Comunicação Social da Aeronáutica,[9] with permission.)

A customer service sector deploys and supports systems developed by the CCA-SJ. This sector was not properly communicating to the Scrum teams. As a result, one of them was issuing deployment delays. The solution was to include a member of customer service in the Scrum teams.

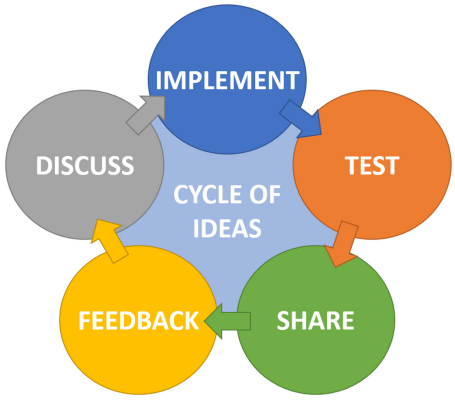


**FIGURE 2.** Cycle of ideas. A new idea is implemented, tested, and shared. Feedbacks are collected and discussed. If there is a new idea from discussion, it is implemented.

Also, the PMO began to show the importance of communication to the staff. As shown in Sá *et al.*'s work,[4] the PMO reduced communication problems by improving its processes. Weekly Meetings with Product Owners have allowed transparency improvement in project monitoring, increasing the chain of command support.

## Protecting the Technical Decision

The pivot conflict experienced in CCA-SJ concerning decision making was the hierarchy. In the military, the highest-ranked officer decides. This rule does not work for Agile development. In Agile, technical criteria must support decisions.

Agile Coaches and Scrum Masters (SMs) did intensive work on raising awareness about technical decisions within teams. Besides, SMs began to treat the issue of hierarchical decision as an impediment. This

change of mindset contributed significantly to reducing programming errors and reducing project risks.

From there on, the CCA-SJ organization noticed a quality improvement on delivered products. Development teams began to prioritize technical decisions over hierarchical ones. Their assistance to the chain of command had also improved.[4]

### Sharing Different Points of View

Sharing different ideas can be challenging since lower ranking officers are often uncomfortable voicing their thoughts. But, every team member usually has different technical knowledge, experiences, and expertise to contribute to the projects.

Since then, this work of encouragement is being done steadily at the CCA-SJ, mainly because sharing different views become a cultural barrier and breaking it is necessary to lead the organization to success.

## TEACHINGS FROM THE AIR FORCE PILOTS TO THE AGILE TEAMS

This section describes some good teachings from Air the Force pilots to the Scrum teams. These teachings could also help to increase organizational maturity, if adequately adapted to other companies or organizations. By using these analogies with the Agile Coaches, SMs, and team members in the CCA-SJ has helped them to better understand Agile.

When the CCA-SJ granted support to Scrum adoption, there were some pilots in the organization. The PMO head was a pilot, the Product Owner and a team member for the C-95 M flight simulator were also pilots. The head of the CCA-SJ and another two officers were pilots too and, at that time, all of them had some Scrum knowledge at different levels.[10]

Although some team members have questioned whether it was possible to adopt Scrum in a military organization, by having this in mind, the PMO head used his experience as a pilot to make analogies between Scrum teams and flight crew members. He did that during weekly meetings with the organization staff by using a lot of dialogues and discussions.

The other pilots have used also other flight crew members leadership analogies to help spread the Agile culture within the CCA-SJ organization.

### Discipline as an Ally

Hierarchy and discipline are the pillars that underpin militarism. While the first was a challenge to overcome in the Scrum adoption, the second was considered an ally.

Both Scrum and Agile have required much discipline to be implemented on this context to follow the Scrum framework, keep meetings focused, and even consciously look for possibilities and opportunities.

### Pilots Having an Agile Mindset

A flight can be considered as a sequence of errors. Some examples are as follows: when a pilot increases thrust, the aircraft speeds up, reacts by climbing, and the pilot or even an autopilot makes flight corrections all the time to obtain steady flights; or even when a pilot makes a turn, the external wing increases lift and drag, and the pilot or an autopilot have to yaw to maintain a coordinated turn.

Everyone makes mistakes. A good pilot learns and corrects fast, mitigating consequences. Not the one who does not make errors.

Besides that, a pilot needs to deal with many other situations. He has to decide quickly, even under abnormal conditions. For example, when flying in formation, each pilot takes care of the other aircraft. The leader must trust his wing and vice-versa.

Agile Culture is about failing, correcting, and learning fast. Trust leads the team to work together. That is another crucial element of collaboration. Any similarity between Agile and pilots mindset is not a coincidence.

### Flight Crews Are Multidisciplinary Teams

A flight crew is a multidisciplinary team. The commander and the first officer are responsible for guiding the aircraft. Who thinks that flight attendants are there only to serve drinks and meals is entirely wrong. They have crucial roles in the crew, once they are, for example, also responsible for flight safety.

Every member of a team has an important role. These roles, together, make the team multidisciplinary and multifunctional.

### Flight Safety Is About Sharing Errors

Pilot mistakes can lead to losses and deaths. A way of learning and avoiding accidents in aviation is from sharing errors. If an accident happens, an investigation occurs. The main reason for that is to prevent similar accidents from happening.

When the culture of sharing errors is solid in aviation, it increases flight safety and reduces accidents. If Agile teams adopt this culture, their maturity level rises fast. This culture is not about accepting errors but avoiding making them recurrent in an organization.

## LEARNING LESSONS

This section describes some of the learning lessons from the Scrum adoption at the CCA-SJ organization that may inspire others in their journey with Scrum or Agile.

### Get Out of Your World

The first lesson learned was: get out of your world. All organizations deal with problems. Getting out of own world and sharing experiences with others outside the organization leads to understanding that problems are everywhere.

In October 2018, 10 CCA-SJ members went to a Product Owner training. They had the opportunity to interact with participants from other organizations. This interaction helped them to understand problems better and seek solutions from outside experiences.[10]

Often, problems from different organizations are quite similar. Sometimes, symptoms may be present in different ways and only are able to perceive them who gets out of their own world and think outside the box.

Hierarchy, command, and control do not exist only in the military type of life. A good example of this came after a conference when an attendee shared his experience working in a family like business structured organization. He told the audience about the rigid hierarchy and communication difficulty. The owner was above 80 years old, and to email him, the sender had to print it and give him in person.

### Reach All Organization Levels

On the CCA-SJ organizational environment, this is also about diversity. In this case, diversity includes hierarchy or the difference between rank levels but is not limited to it. The concept of diversity encompasses also acceptance and respect.

When diversity is well understood, accepted, and respected, the overall engagement increases with the odds to reach goals.

One of the basic premises of the PMO team was to reach all levels of the organization. To succeed in the Agile adoption, it was not enough to make a top-down or a bottom-up approach, but both. After the PMO creation, the team increased from three to nine people, with different ranks, to attend this premise. That was paramount for the CCA-SJ organization to succeed with the Scrum.[10]

The head of the CCA-SJ is usually an FAB colonel. Scrum Team members have different ranks, from sergeants to majors. The prior PMO head was a lieutenant-colonel, so he could easily reach the head of the CCA-SJ organization. PMO members rank diverse to reach all levels inside teams and the organization.

### Adapting

Adapting is not "just a pillar" of Scrum. It is also essential to adapt the Scrum to some specific needs. Once the CCA-SJ is a military organization, it follows laws, legislations, and other regulations. These documents did not include the Scrum yet. And so, the adopted solution was to update the internal regulation of the CCA-SJ organization.

That update inserted the PMO in the organizational structure, also institutionalizing Scrum teams within the CCA-SJ. An important modified aspect was that Scrum teams started to have no hierarchical ties with any sector of the organization, leading to consistent results.

The ties of Scrum teams with the CCA-SJ became two:

- *technical advisory* to the sector responsible for software or flight simulator development;
- *support advisory* to the PMO.

The Scrum events became also taken more seriously by the CCA-SJ. The SMs have changed their behavior more often warning teams about new events. One of the resources used to make sure the Scrum events will happen is the Weekly Work Board [Quadro de Trabalho Semanal (QTS)]. The QTS is a document often used by the FAB organizations that sets their weekly routine. If an event is on the QTS, the staff must follow it.

The use of the QTS to schedule the Scrum events helps prevent other tasks from being assigned to the team members, avoiding conflicts. Before that, it was not rare for a team member to miss a Scrum event because he followed an order from a higher ranked officer.

### Do Not Impose Ideas

Anyone inside an organization may have good ideas. The best approach is to encourage the owner of a new concept to implement and test it if it happens. Moreover, to make it public, the act of imposing ideas only leads to change resistance.

If other teams believe it is a good idea, they will use it voluntarily. That works even better when a new idea becomes a success story inside an organization.

An example was the DevOps adoption. A team started a new project and adopted DevOps, which implied using a different tool in its free version. The

other teams liked the idea behind DevOps, so they migrated tools to support its adoption. After that, all teams started using DevOps, and the organization has acquired the license for the overall use of this complete tool.[10]

On the other hand, there was no problem if a team had a new idea and others do not implement it. If this idea did not conflict with internal standards, the team could implement and test it.

## HOW COULD THIS ARTICLE BE USEFUL TO OTHER ORGANIZATIONS?

The State of Scrum survey collected data from different organizations with different cultures around the world. It did not limit itself to military environments. As it shows, the "problem," or the "challenge," dealing with top-down management, command-and-control, and organizational culture is not exclusive for the military. Hierarchy is a pillar that underpins militarism, but it does exist in other environments, private or public, even if they are civilians.

If dealing with hierarchy is a challenge and can be overcome in a military organization, why not in others?

## FINAL CONSIDERATIONS

This article shared the experience of Scrum adoption in a strongly hierarchical organization. Scrum teams are self-organized, meaning no one tells them how to do their job.

Hierarchy is a pillar that underpins militarism. Then, a paradox is noticeable between Scrum teams and groups formed by military personnel. However, the "problem," or the "challenge," dealing with hierarchy is not exclusive for the military environment.

The turning point for the CCA-SJ organization to succeed with Scrum was the institutional support. This article also described other resources that helped this Brazilian military organization turn the game around after failing on prior attempts.

This article also shared some teachings from Air Force pilots that helped Agile Coaches and SMs of the CCA-SJ to spread the Agile Culture within the organization.

The main contribution of this article is the learning lessons that may inspire other organizations to succeed with Scrum or Agile adoption. Once a strongly hierarchical organization has done it, why not others can not do so?

The journey did not finish. The CCA-SJ organization started with Scrum adoption within development teams that became an Agile transformation. Culture and mindsets are changing. The next step is to work with other sectors beyond Information Technology, such as human resources.

Finally, while the CCA-SJ is reaching new steps of success with Scrum and Agile, other organizations inside the FAB are already in contact with the CCA-SJ organization to share experiences and learnings. The main goal in this knowledge domain for the CCA-SJ is to become a reference in Agile methods within the FAB.

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