

To fly or not to fly?

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Situation sketch

The situation to be simulated in the play describes the day of the launch of a new 62 passenger aircraft fully constructed out of carbon nanotube composites at Schiphol Airport in 2009. It is the first of its kind and the spectacular result of an extremely fast development program by the newly founded company DUTCH (Delft University Technology Centre for Hybrids). Thanks to the concerted efforts of all parties involved in the field of aerospace technology in the Netherlands and the use of their novel nanotube composite technology developed at the TUDelft, DUTCH was able to realise this plane in record time and to beat the American and European competition. Today at 16.00 hours the plane is scheduled to take off from airstrip 5 at Schiphol in the presence of his highness King Willem Alexander and the prime minister Jan Peter Balkenende, as well as foreign dignitaries and aerospace officials.

The plane has been stored in hanger Leonardo Da Vinci during the night prior to the launch, but at 4 a.m. in the morning an over-stressed employee of DUTCH, embittered by the announced termination of his contract, intentionally drove his fork-lift truck into the junction between the fuselage and the wing. Directly after the accident, the driver was overpowered by the guards and taken into custody. The guards had no clear instructions who to warn in this unlikely situation and after some deliberation decided to call the project manager for the launch event, Ir. Jan Jansen, Vice President Development at DUTCH, before sealing off the hangar hermetically. Ir Jansen holds a degree in aerospace engineering and was professionally well qualified but deserved his high position within the company for the ruthless way in which he made sure all deadlines in the project were met. Mr. Jansen received the call at 04.30 at his house in Amsterdam Zuid.

Ir Jansen immediately called the two senior engineers responsible for the final preparation of the plane for its launch, ms Ir Hilma Bleekstra and mr. Joop Bont and together they carefully inspected the aircraft and to their great relieve they found no visible damage apart from possibly the suggestion of a narrow scratch of 15 mm length perpendicular to the leading edge of the wing well outside the reported impact area. Every aerospace engineer knows, that the lack of visible damage on the surface of the composite material doesn't say much about the damage done to the internal structure. Actually the fact, that composite material still isn't used often in airplane industry is due to the fact that it is difficult to get unambiguous evidence about the quality and cohesiveness of the internal structure, which is difficult, if not impossible to measure.

As the nano-composites are a very new material development there is not as wide an experience in predicting the residual strength after impact as for metallic aircraft structures or carbon fibre composite structures. The nanocomposite structures generally behave in a similar way as the carbon fibre composites in that the most severe damage is not at the impacted site but at the opposing rear side, where large scale delamination may occur. The occurrence of rear surface damage depends on the bending stresses during impact and these stresses drop sharply for thicker composite sections. Of course at the site of the impact, the wing root, the composite is rather thick as the forces there can be rather large. Unfortunately, to offer maximum performance and reliability the rear surface of the wing root can not be visually inspected except by totally dismantling and reassembling the wing, which takes about two weeks.

The NDO (non-destructive inspection) technique did not reveal an unambiguous picture of the damage in this case. Due to the damage on the front side, the sound waves were distorted and the absence of any rear surface damage could not be inferred. However, it was also clear that major rear surface damage could not be present. So, there may be damage, but not severe one. The precise surface area of the rear surface damage can not be detected and best estimates range from 5 to 25 cm². These values, as well as some guessed dimensions of the other internal damage, can be used in residual strength calculations. These models are well validated for classical carbon composites and generally hold for carbon nanotube composites too.

After some discussion, which was dominated by mr. Jansen, it was decided not to report the incident to the authorities as it was felt that this would mean that the launch was to be cancelled anyhow, nor to inform any other DUTCH employees, except the president of DUTCH, mr. Mr Henk Knul RA. Mr Knul had no aerospace engineering qualifications but had a background in law and finance. He had been appointed president of DUTCH for his fabulous expertise in arranging the financing of DUTCH as well as the development of the plane. Furthermore, his political network was exceptional and he had become a personal friend of both the Prime Minister and the Minister of Economic Affairs during the development process.

As Mr Knul was taking an early shower, it was not until 06.30, that the contact was made and mr Knul was informed about the incident. Being fully aware of the implications immediately, mr Knul judged it was not for him to decide single handed on what to do or not to do and he decided to respect the judgment of mr. Jansen and the senior engineers for the time being, but to call an emergency meeting of all the management team (MT) members of DUTCH to discuss the matter in more detail. The emergency meeting was to take place at 08.00 in the office of mr Knul at Schiphol Airport. Invited to this meeting were Ms Tonny Ruwee, director finance, ir. Hans Hervee, chief engineer, mr. Erik Pauw, head personnel and mr Ben de Vlieger, director communications, as well as mr. Jan Jansen, vice president Development. All MT members were approached by Mr Knul himself by phone, were informed about the situation and were ordered to attend the emergency meeting.

Due to the unavoidable traffic jams around Schiphol both mr Hervee and mr Pauw did not reach mr Janssens office until 08.10, while the others were present at the appointed time. Given the urgency of the matter, mr Knul decided to start the discussion at 08.00 sharp, even though not all MT members were present.

The MT meeting tries to reach a decision before 08.30. Note that two of the players only take part in the play for 20 minutes and are not aware of what has been said so far.

Number of players : 6 (4 +2). Duration of the play : exactly 30 minutes !!!

After 30 minutes mr. Knul announces his personal decision. During this play at a time which is to decide by the chairman two experts may be called in, Mr. Niemandsverdriet and Mr. Klokkenluider. They did research after the damage with the help of computer programs.

For the sake of the play, the decisions to be taken by mr Knul are limited to the following options :

1 : it is decided to continue with the preparation of the maiden flight and not to inform the public. There is to be a further in-house technical evaluation of the damage.

2. it is decided to inform the authorities but not to go public. Further technical evaluation of the damage is to take place in parallel. In this case Mr. Knul informs Mr. Leeghof.

3. it is decided to cancel the maiden flight straight away and to go public.

However, option 1 and 3 can be overruled by option 4. :

4. If only one person in the room "secretly" informs Mr. Leeghof another round starts. Mr. Leeghof immediately makes a phone call to the Prime Minister Balkenende and the Minister of finance, Mr. Bos. They join the meeting by phone. Option 2 of course immediately leads to option four,, because Mr. Leeghof takes the same action. All the participants have a "red card". If in case the decision is taken not to inform the authorities and to go on with preparations for the flight, only one participant puts this red card on the table, that means, that Mr. Leeghof has been informed "secretly" and the next round in the discussion starts, with Mr. Leeghof, the Prime Minister, and the Minister of finance.

If the play reaches option 4 another 10 minutes may be taken to reach a final decision.

The game thus has four stages:

1. The MT during the first 10 minutes:

Characters:

Mr. Knul, director

Mr. Jansen, vice director development, engineer

Mr. Vlieger, public relations

Mr. Ruwee, finances

2. The MT during the next 20 minutes:

In addition:

Mr. Pauw, head personal

Mr. Hervee, chief engineering

3. The MT somewhere during these same 20 minutes:

In addition:

Mr. Niemandsverdriet airspace engineering

Mr. Klokkenluider airspace engineering

They can be called "in" to report on their findings.

4. The MT during an additional 10 minutes:

"By phone" three other participants enter the discussion:

Mr. Balkenende, Prime Minister

Mr. Leeghof, Director Air Safety Netherlands

Mr. Snoek, Minister of finance

The group can decide to put in money of the participants and the amount of euro per person should in this case be determined by the group. This of course can only work, if the whole group agrees. It makes the situation more realistic. The students can lose the money they invested depending on the decision taken and the final outcome. A good cause can be determined to which the money is going, if the plane crashes.

In case the final decision is to fly, a lottery will determine if the maiden flight is successful or leads to catastrophic failure of the plane.

Students, not playing a role in the game, are to take notes and analyze the conduct and argumentations of the players, from an ethical perspective. They will have to report about four aspects of the communication and decision-making process, which in case of more than one observer can be divided among the observers.

1. The **normative** dimension: sometimes explicitly, but mostly in an implicit way, all the time the participants in a discussion refer to moral norms and values. Safety, loyalty to the company, not lying, etc. Somebody might say "I am not going public in order not to damage the reputation of the company" - in such a case the norm is loyalty to the company, even without being explicitly mentioned. Keep track of such norms and values, whether implicitly or explicitly referred to, and how they play a role in the decision process.
2. The **performative** dimension: this refers to the performance of the participants in the discussion, their authenticity, credibility, the impression they make or try to make, and by which they either are open to or manipulate their opponents. For instance, somebody might become angry, somebody might try to give another person the feeling of having said something stupid or somebody might try to give the impression that any normal person would act and speak like he or she. "Are you serious!", or "That's ridiculous!" or "Any normal person would...", are such expressions, by which people try to make room for themselves and push their opponents away. However, questions like "Do I understand correctly, that you mean...?" or "What is your opinion?", are signals of openness and sincerity. Often trust and good relationships are lacking for asking such questions. If the communication channel is blocked,

people stop taking each other seriously. They already "know", that the opponent simply belongs to another party and they don't even try to speak to each other and don't even try to convince or listen to each other. This too belongs to the performative dimension.

3. The **informative** dimension: this refers to the question, whether the information available is presented in a coherent and clear way, without ambiguities and without unjustified shortcuts. To what extent do the participants in a discussion build up a reasonable argument or try to do so? Do they succeed in pointing to internal contradictions in the reasoning of the other party? Do they make use of all the relevant information and arguments at their disposal? Has all relevant information for the final decision been made explicit?, if not, why not?
4. The **responsibility** dimension. The game is so structured that the different participants have different responsibilities and different authority. Do the participants live up to their responsibility? Might we have expected more from them, or not? Also look at the division of responsibilities and authorities. Maybe some actors, like the engineers, have a certain responsibility but lack the authority to speak out or to make a decision. Maybe, there are certain gaps in the division of responsibilities: some information might remain unrevealed or some considerations may not be taken into account because it was not the explicit responsibility of any of the actors to do so. Still, from an overall perspective, it might have been desirable that this information had been revealed or these considerations were taken into account.

After the game first the observers will report their findings and then the players in the role game will evaluate their roles and the outcome of the game. It can be analyzed and explored, whether a different outcome would have been the result, if some of the players would have acted differently either on the normative, performative, informative or responsibility dimension. Questions can be asked like: have the norms at stake been made clear? Have they become explicitly part of the discussion (what usually reinforces them)? Could the participants have performed better in terms of open communication? Were they authentic, listening, responsive, open, or using rhetoric, bullying even etc.? And what was the effect of all that? Etc. etc.