Defence and responsibility. How can we ensure that new technologies are used responsibly in a Future Combat Air System?

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21st century technologies are revolutionising not only the economy and public and personal life but also internal and external security. They are shaping the prospective Future Combat Air System, the most comprehensive programme for protecting the sovereignty and freedom of the participating countries ever seen. But how do we continue to keep up with our defence technologies? How do we ensure that they are used responsibly? The FCAS-Arbeitsgemeinschaft Technikverantwortung (FCAS Expert Commission on the responsible use of technologies) is looking for answers.

On 6 February 2019, the defence ministers of France and Germany signed the deal to launch the joint development of a Future Combat Air System (FCAS), the most ambitious European defence project for decades to come. Its capability will far surpass that of existing air combat systems such as Eurofighter or Rafale.

Manned next-generation jets are integral elements of a complex and fully networked 'system of systems'. Remote carriers acting as 'loyal wingmen' protect the pilots and support them in combat missions. Open system architectures enable existing platforms to also be integrated into FCAS. The heart of the system is an air combat cloud, which provides the actors involved in a mission with all relevant information in real time. Up to now, the success or failure of a mission has been determined by the necessity to obtain airspace sovereignty, while in the digital age, decision-making sovereignty is the decisive factor.

This is why FCAS is not only an important defence policy project but also a milestone in the development of high technology in Europe. Moreover, for Germany in particular it will create opportunities to assume a leading role in pioneering future technologies such as artificial intelligence (AI), big data analytics, crypto components or human-machine interaction.

However, programmes such as FCAS also bring into stark focus the ethical and legal challenges of digitalisation. Successfully demonstrating that it remains possible to use digital technologies responsibly in the context of FCAS will greatly benefit their use for civilian purposes as well. The 'ethical minimum' is, of course, to comply with statutory requirements, but the issue of social acceptance also has an important role to play.

Manned components will continue to be at the heart of FCAS in the form of the new combat aircraft that is still in development. This constitutes the starting point for all further technological and strategic planning and is based on the premise that human decision-making remains pivotal in all conceivable FCAS mission scenarios. In other words, FCAS is no exception in that it is subject to what was laid down in the Military Aviation Strategy 2016: Weapons can only be deployed if controlled by a human operator.

Industry and research institutes have been cooperating for many years in laying the technological foundations needed for FCAS, out of which has emerged the concept of using information technology and engineering science design methods to advance the operationalisation of ethical and legal principles. This poses a two-fold challenge: firstly, defining the relevant principles, and secondly, implementing them through technology.

What has evolved is a format that uses a systematic approach in the endeavour to ensure that fundamental ethical and legal principles are integrated into research and development for FCAS and that these principles are upheld in its technical implementation. To this end, Airbus and the Fraunhofer Institute initiated the FCAS Expert Commission on the responsible use of technologies (Arbeitsgemeinschaft Technikverantwortung) which, on a technological level, benefits from the complementarity between industry and research, each of which has different roles and expertise.

One important task is to determine ethical guidelines based on international law and to ensure their technical implementation. The proposed overarching FCAS Air Combat Cloud architecture can contribute to achieving this aim by reducing the complexity of future missions for those responsible for deployment and facilitating human decision-making. Reducing complexity by technological means is a key development objective.

However, technology is just one aspect. Important stakeholders from ministries, authorities and the Bundeswehr are participating in the expert commission. German information technology and engineering science, represented by universities and research institutes such as Fraunhofer, plainly have a significant role to play. German industry is on board in the form of the national FCAS prime contractor Airbus. However, the element that is crucial for success is

society as a whole, represented by a broad cross-section of political foundations, universities and political and social science think tanks all playing their part in the FCAS expert commission.

Their members are bound solely by their own conscience and do not need to harmonise their positions with the interests of the organisers or the institutions to which they belong. On the contrary, the format depends on and thrives from critical discourse. It is planned that the expert commission will meet twice a year. Each of these meetings will deal with specific questions. The outcome of the discussions will be recorded and published on a website specifically designed for this purpose. The corresponding internet presence is in the process of being set up.

Already it is becoming apparent that key issues surrounding the discussions are technical manageability and personal responsibility, because ultimately an FCAS is an overarching system which, to an exceptional extent, will be characterised by artificial intelligence and comprehensive automation.

Wolf von Baudissin, whose visionary concept shaped the Bundeswehr and who had drawn lessons from experiencing dictatorship and 'total war', put these ideas into words in a timeless fashion: "Any high-technology combat demands that a lot of people lower down the line must recognise their responsibility and shoulder it. For this reason, we have to do everything to confront people with situations which make them take responsibility and which make them fully aware of the consequences of their actions or inaction."

Responsibility as a principle is more fundamental than concepts such as 'human-in-the-loop' or 'human-on-the-loop'. After all, even the use of automated defence technologies can be justified in cases where, for example, human reaction time is too slow or the amount of data is too large. For this reason, digitalisation in defence and security must guarantee technical manageability *and* responsible deployment in equal measure. Human beings must be an integral part of automated systems, too, not only through the decision to use the system but also through their endeavour to configure it in such a way that meaningful human control is fully ensured at all times. Specifically, this means that, based on rules defined by human beings, it can be justifiable to allow automated decision-making to take place. That said, it is necessary to be able to assess whether the underlying rules can be applied to the purpose of the deployment in question and whether they are ethically justifiable. The aim is to give the circle of people using the technology – in the case of an FCAS, for instance, the pilots – the knowledge that forms the basis for them to be able to trust an automated decision-making support system while at the same time familiarising them with the parameters underpinning the set of automated rules.

For the first time in the history of the Federal Republic of Germany, a major defence policy project is being accompanied from the very beginning by an intellectual struggle surrounding the technical implementation of fundamental ethical and legal principles – also referred to as 'ethical and legal compliance by design'. FCAS has been designed as a European project, so over the medium term FCAS AG Technikverantwortung is to be expanded across national boundaries

The aim is to operationalise the acquired knowledge in an effective manner. Our readiness to defend ourselves against heavily armed adversaries must not only be credible in terms of the technology involved but also comply with the objective set out in the German Basic Law: 'Conscious of [our] responsibility before God and man […] to promote world peace […] in a united Europe.'

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