Technology Forecasting and Policy Implications:

Summary of Recommendations

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Introduction

The program on Technology Forecasting and Policy Implications, established at the Institute for National Security Studies (INSS) in 2012, was designed to examine and demonstrate the ability to combine long term technology forecasting with the process of policy formulation.

The ability to forecast the likely main capabilities technology of twenty years hence has thus far not been recognized as a policymaking tool, either on a national level or within the defense establishment. The main premise underlying this INSS research program is that policymaking can and must use the insights technology forecasting can offer. To this end, INSS launched a “demonstration program" in order to explore this very claim, namely: how can the process of technology forecasting contribute substantively to the policymaking process.

The initial research phase within the framework of the program comprised a demonstration process combining technology forecasting with policymaking for the purposes of offering policy recommendations for Israel. The reason this specific technology was chosen for the demonstration process was because of the increase in the: development, purchase, and operational use of these systems within the past two decades by.

The use of unmanned systems reduces the risk to human life and expands operational possibilities to include tasks that cannot be performed by human beings. As a result, use of unmanned systems for various purposes by states, organizations, and individuals has increased rapidly. As such, unmanned systems have played a growing role in recent years in operational military activity in the air, on land, and at sea, gradually replacing manned systems. This is a process occurring all over the world, with the US armed forces leading the trend. Against this general background, joined by specific numerical data concerning procurement and development programs in this field worldwide, the basic

assumption of the study is that there will also be a quantum leap in use of these systems in Israel, whether Israel prepares for it proactively or is dragged into it and then propelled to respond.

The growing operational importance of these systems worldwide heightens the need to understand and assess their future technological capabilities; to examine from a broad perspective how their widespread use is expected to affect the military and the state; and for Israel, to suggest a thoughtful policy so that Israel can be included in the global process and perhaps even be one of its leaders, while it focuses on the particular dimensions of this process that best suit it so that it can fully exploit the opportunities it creates.

In the first phase of the study, technology forecasting was used to envision the use of unmanned military systems in 2033. This in turn served as the basis for the phase of policy formulation within the framework of the program. The main purpose was to formulate recommendations for Israel for long term policy action in the area of unmanned systems on the basis of the outcome of the technology forecasting.

This document is an interim summary of the study before the publishing of the full and final document. It contains policy recommendations for the State of Israel based on the claim that the use of unmanned systems for military purposes will greatly increase in the next two decades and that there is a need to prepare for this in order to maximize the potential of this field on the one hand, and to cope with the challenges and risks in the best possible way on the other.

Summary of the Process and Recommendations

The process of shaping policy, the second stage of the study on technology forecasting and policy implications, was based on the conclusions of the technology forecasting stage. The initial research phase, on technology forecasting, presented forecasts regarding unmanned systems for a period of twenty years. Three main conclusions emerged from those forecasts:

- It will be possible to plan almost any tactic military task by autonomous systems.
- It will be feasible for unmanned systems to carry out almost any military tactic task.

- Unmanned systems will usually work in groups (part of them are “swarms”).

In the second stage of the study, the Imen-Delphi (ID) methodology, which belongs to the approach of shaping desired futures in the field of future studies, was used. The study makes use of a specific internet system to conduct a collective online discussion with many participants in accordance with the principles of the: "wisdom of crowds". The methodology allowed the group to cope with complex problems and propose solutions in a number of stages, during which the participants: asked questions, responded to questions, and assessed and explained the various responses. A group of some twenty-five professionals from different fields important for shaping public policy participated in the process. They took part in the study and the process of policy formulation, as described in detail below.

Main Findings

The findings of the policy shaping stage of the study can be presented on three levels:

- **Direct recommendations:** This is the basic level of recommendations, namely, recommendations presented as they were formulated by study participants in the policy-shaping stage. The recommendations are those that were given the highest ranking by the group from among a variety of recommendations that arose during the process. These are relatively narrow recommendations that generally address one action in a specific field. They reflect the group's view of the main policy guidelines and are actually direct recommendations for the state of Israel to adopt in order to fully exploit the potential inherent in the process of expanding the use of unmanned systems for military purposes.
- **Interpretative recommendations:** These recommendations are implied in a more general way by the course of the discussion. These are general trends that characterized or were implicit in comments by the participants. Hence the term “interpretative recommendations” meaning that the authors have formulated them.

It is proposed that the discussion of these recommendations be pursued and expanded in a subsequent research.

- **Pointing to future study:** This level of interpretation looks analytically at the possible effects beyond technology forecasting and is an analysis of possible trends resulting from the use of unmanned systems. It is hoped that this level will constitute a recommendation for thought and future studies in the field.

Summary of Direct Recommendations

1. The defense establishment and intelligence agencies should prepare for a broader and deeper integration of unmanned systems in the area of intelligence gathering.
2. The defense establishment should implement concepts, processes, and methods that will enable new arsenals of unmanned systems to be integrated and made operational rapidly and comprehensively.
3. Israel should develop a policy, combat doctrine, and capabilities to cope with the unmanned arsenals of enemy states and organizations.
4. Israel must maintain core manned operational components in its military capability, even in an era of widespread use of unmanned systems.
5. Israel must give ongoing thought to the nature of the unmanned arsenal and future doctrines of use and update them on the basis of relevant technological developments.
6. Israel should develop study and training programs that support the various aspects of the field of unmanned systems and encourage people to join them.
7. Israel should exploit its advantage in the field of unmanned military systems in order to become a significant player in the developing global civilian unmanned systems market.
8. Israel should define and conduct a comprehensive concept of defense and survival for its unmanned arsenal that includes clear principles and objectives.

9. Israel should define a technology roadmap to guide research and development in the field of unmanned systems on the basis of its comparative advantages, unique needs, and export potential.
10. Israel should create intelligence and legal cooperation with other countries in order to reduce the access of terrorists to unmanned systems.
11. Israel should allow the defense industry to engage in international cooperation and to export Israeli unmanned systems, subject to the defense establishment's inspection mechanisms.
12. Israel should take an active part in formulating international treaties to restrict the use of unmanned systems in order to influence their character and to ensure its security and economic interests.
13. The IDF should tailor the model of regular military service and reserve duty to the era of unmanned systems in terms of the number and attributes of those serving, as well as the characteristics of their course of service.
14. The defense establishment should construct a big data infrastructure as well as processes that will enable the storage, processing, and analysis of the quantity and variety of the information to be collected by the unmanned arsenal.
15. Israel should allocate resources in its defense budget to the unmanned arsenal by reducing the budgets for manned arsenals.
16. Israel should develop the fields of defensive cyber operations and electronic warfare as means of coping with terrorism that are based on the use of unmanned systems.
17. Israel should implement international standards in the field of unmanned systems and be an active and influential partner in their formulation in international forums.
18. Israel should create close cooperation in the area of unmanned systems between academic institutions and the defense industry.
19. Israel should prepare for operational cooperation among armies in the field of unmanned systems by defining and implementing a policy of cooperation and communications protocols that will make this possible.

20. The defense establishment should implement a concept of retaining manpower in the field of unmanned systems that will be based on an ethos, ethical standards, challenges, career, and compensation in order to contend with the competition from the civilian market.

Interpretative Recommendations

1. **Formulation and Implementation of a Comprehensive System-Wide Concept for Unmanned Systems**

   The widespread use of unmanned systems has great potential to make changes in the building and use of military force and in many other areas, such as the civilian market. It is possible that decision makers in Israel are not aware of this potential, and in any case, are not acting accordingly.

   Recommendation:

   To take a decision concerning a comprehensive, top-down Israeli process and the establishment of management institutions, political and military, to guide and monitor it.

2. **The Need to Have a "Man in the Loop" vs. the Granting of Full Autonomy**

   Technological development will bring capabilities in the field of artificial intelligence to the point where it will be possible to use autonomous systems in a variety of areas. Nevertheless, the legal system and the legal infrastructure in the country (based on thought in the field of ethics) are not prepared to give broad freedom of decision to systems not controlled by human beings.

   Recommendations:

   a. To give priority to the legislative-legal and procedural issues and to debate how best to address the issue of ethics in accordance with the new technology. This activity should be carried out with as broad international cooperation as possible in order to create legitimacy.

b. To give priority to developing capability in areas that are not ethically/legally controversial, such as intelligence and logistical tasks.

3. Change in the Pace of Integrating Unmanned Systems and Making them Operational

The rate of penetration of unmanned systems and autonomous capabilities will be much faster than similar processes in the past.

Recommendation:

To establish the necessary infrastructure to lead the process as quickly as possible and to analyze in depth the economic advantages that widespread use of unmanned systems could have for Israel.

4. International Cooperation as a Tool for Operation and Defense

A variety of subjects point to the need for extensive international cooperation in this area. This is also reflected in the potential for joint development, the need to meet common standards, and the need for operational cooperation, as well as the need to prepare jointly for the abuse of unmanned systems.

Recommendation:

Israel should adopt a policy that favors the widest possible cooperation and should work to lead and influence international forums.

5. Changes in the Profile of IDF Service

A large arsenal of unmanned systems will probably lead to a decline in the demand for combat soldiers and in particular, reserve combat soldiers. A significant reduction in the combat soldiers reserve force, together with a demand for a high level of professionalism on the part of operators of the system, could signal the end of the era of the reserve army and its replacement by a different model of service.

Recommendation:

All aspects of the profile of service in the IDF should be reexamined, including the public discussion on the equality of the burden. Changes in education should also be examined in order to train appropriate personnel even before their military service.

Future Trends beyond the Area of Technology Forecasting

1. We should anticipate the effects on the national budget and the defense budget. Areas that are major items in the defense budget as of 2013 could decrease significantly or disappear altogether. At the top of this list will be training of reserve soldiers and procurement. In addition, significant changes can be anticipated in the realm of logistics in general. Additional items that can be expected to decrease are those connected all main manned combat platforms aerial , AFVs (armored fighting vehicles) and maritime . Along with the decrease in these areas, budget items connected to new arsenals that will require a broad allocation of resources could appear and grow.
2. The ability to cause a tactical surprise could decline. The combination of ongoing, extensive intelligence collection, the ability to analyze information rapidly on the basis of big data, and rapid decision making will gradually bring leaders and countries to the realization that tactical surprises are difficult to achieve. This could significantly reduce the motivation to launch a surprise attack.
3. A significant change in the concept of victory can be expected. The increased use of unmanned systems could reduce the ability to force a classic military decision. Furthermore, the temptation to initiate a full military campaign will also be reduced.

Conclusion

The use of unmanned systems in the battlefield is increasing. Israel is one of the leading countries in this field, in terms of both development and operational use of these systems. Nevertheless, the results of a demonstration study carried out in the program in Technology Forecasting and Policy Implications at the Institute for National Security Studies indicates that Israel's political leadership act as it does not aware of the potential of this field. Today, this leads to an unorganized process of development carried out from the bottom up, and there is a lack of comprehensive focused policy to fully exploit the potential and assess the changes required for an era in which there is increased use of such tools for military purposes.

The policy formulation stage carried out on the basis of the technology forecasting stage (which created a forecast for unmanned military systems for 2033) includes recommendations formulated using a method based on collective wisdom. This stage produced a variety of recommendations for Israel, including the need to manage the process of the expanding use of unmanned systems with a top-down approach. For the purposes of such a process, a guiding institution, such as a civilian administration, is needed. This institution must have regulatory and budgetary powers in research and development, standardization, legislation, industry, international cooperation, determination of long term goals for the Israeli economy, and translation of objectives into a work plan. There must also be a guiding military body that will be responsible for developing and implementing roadmaps for the military force, research and development, personnel planning, legal advice, procurement, external relations concerning unmanned technology, developing concepts and training, and also budgetary planning.

The discussion also points to long term aspects and the potential for this field to have strategic impact on the international arena. For example, it could eliminate the advantage of states with large populations in the long run, potentially change the concept of victory, potentially cause a decline in the ability to bring about a tactical surprise, and weaken the nation state's monopoly on the use of force.

The demonstration process suffered from a number of weaknesses because of its small size and the relatively short time allotted to it. However, the present results indicate that there is a need for an immediate change in the way in which the State of Israel is managing the increased use of unmanned systems for military purposes today and the processes that surround it. Therefore, the subject must be studied in greater depth and a national policy adopted that will make it possible to enjoy the advantages and minimize the risks inherent in this area. In addition, the study results indicate that it would be appropriate to study this field further and in greater depth, with an emphasis on interaction with issues such as the economy, power, the security concept, civil-military relations, and many other topics.