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SPEECH BY SENIOR MINISTER OF STATE FOR DEFENCE, MR HENG CHEE HOW, AT THE YOUNG DEFENCE SCIENTISTS PROGRAMME CONGRESS AT MARINA BAY SANDS, ON 18 APR 2019, 1500HRS

Board Members and Management of DSTA and DSO,
Principals and Teachers,
Parents and Students,
Ladies, Gentlemen and Friends,

1. A very good afternoon to you all and it is my great pleasure to be able to join you at the Young Defence Scientists Programme, or YDSP Congress 2019.

2. For many years, the YDSP has provided a platform for our youths to discover the importance of technology, not just in our daily lives, but critically, technology's role in the defence of Singapore. Through the YDSP, youths have come to appreciate the exciting world of our defence engineers and scientists, learnt about their work, and experience the thrills and complexities of designing solutions to address the challenges and issues we face and how we overcome the constraints.

Rapid Evolution of Technology

3. Over the years, technology has revolutionised our world, transforming the way our societies operate and how we live, work, play and interact with people around us. For example, according to the US Department of State's Foreign Service Institute, they estimated that it takes someone around 4,400 hours, or 183 days, in order to learn a new language. It does take some time but today with technology, the journey can be made a lot easier and more accessible to a lot more people. For example, what a company like Google has done is they have developed this thing called the Pixel Buds, which is a pair of wireless earphones. Plug it in and it utilises online

translation technology to facilitate communication in different languages close to real-time. Essentially it closes the gap and operates in a very proficient way very quickly. This example shows how technology is able to save time in the mastery of languages and overcome language barriers. Sometimes when we think about learning languages, you may think "how do I learn to understand the words or the vocabulary, to be able to read or write?" But increasingly in a globalised world, our work and lives will involve travel, it will involve working in different locations and there is a lot more interactivity. In different societies and different cultures, they may require you to understand one another quicker and better. The ability to understand and utilise language becomes even more important. So this technology is more than making something more efficient. It creates better outcomes in world of work and daily living as well.

4. Most of us here have ordered a taxi or a "Grab" from the streets. In the near future, we might actually be able to hail an "air taxi" to anywhere around our city. So this way, perhaps you can avoid traffic jams and congestion, until our skies are congested. Uber Elevate is planning to launch UberAir, which is an urban aerial ridesharing service, by 2023. And in Singapore, by the second half of this year, there is a German company Volocopter who will be conducting a series of urban flight tests for "air taxis".

Defence Technology a Key Enabler

5. There is boundless potential in harnessing the latest technologies to create breakthrough solutions and new capabilities. Our Pioneer generation and leaders recognised the importance of building up scientific and engineering expertise for Singapore's defence. And when it comes to defence, defence is not something that we can rely on others for. Others do not have the incentive or the inclination. When push comes to shove, to make sure that we exist or that we prosper, we have to make that sure ourselves. While Singapore does not have natural resources or strategic depth that many other countries possess, we have been leveraging on the strength of our people to give us that ability. Our people represent our greatest potential. We develop it properly and they become our greatest asset and advantage.

6. Today, our Defence Technology Community (DTC), comprising some 5,000 scientists and engineers across the Ministry of Defence (MINDEF), Defence Science and Technology Agency (DSTA) and DSO National Laboratories (DSO), has been instrumental in turning our constraints into opportunities and delivering innovative solutions that will meet our needs and overcome our constraints.

7. Take the Republic of Singapore Navy's Invincible-class submarine, for example. Using smart algorithms, our defence engineers developed decision support engines used in the Combat Management System to provide our submariners with higher situational awareness and enhanced combat capabilities. Our engineers also embedded automation in the designs of the Navigation, Engineering, Sensor and Weapon stations in the Combat Information Centre. What all this means is, if you use all the science and use all the technology, bring them together and integrate them in a very smart way, the outcome is that it enables the Invincible-class submarine to be operated by

far fewer members compared to those that are much larger than itself. For example, its predecessors, the *Archer*-class submarines.

8. In the area of drones, our defence engineers are developing drones that can conduct autonomous operations and are augmented with machine learning capability to support the identification of targets. Soon, drones could be used to perform tasks such as runway inspection and the patrolling of our air bases, allowing our servicemen to focus on sharpening their fighting capabilities.

9. Our defence scientists and engineers have also designed and developed Unmanned Watchtowers, which enhance our coastal surveillance. With the use of video and data analytics, the unmanned towers can automatically identify potential threats and alert the soldiers at the Command Centre. This reduces the manpower required for coastal surveillance by 30 percent, allowing our soldiers to be deployed more efficiently for other tasks. This is not a trivial point because one of the key challenges that Singapore faces is our low fertility. In other words, we do not have enough babies. So in time to come, what does that mean for the numbers in our defence forces? If people are really hard to come by, then in combat, you have to figure how do you do more with fewer. How do you do a better job of protecting those that you have, so you do not suffer unnecessary casualties to the extent that is humanly possible. So by using technology, not only can you make inspection work less tedious and more efficient, you will contribute to preserving the fighting strength of your forces. At the same time, allow people to undertake higher value work and more strategic work that can make that difference in the outcome in terms of contest with our adversaries.

10. In the near future, SAFTI City, the first-of-its-kind training facility, will be built to allow the Army to train across a wide spectrum of mission scenarios in both urban and conventional terrains. Our defence engineers will leverage state-of-the-art training simulation technologies and data analytics to create an immersive training environment that is tailored to soldiers' learning requirements. This enhances our soldiers' training experience. If designed properly, it can be very realistic and our guys can hone their skills and reflexes so that when they actually get out there, it is a lot safer and much more effective. So again, technology has come to enhance our capability building and effectiveness. We will keep on doing this and more.

Grooming Future Defence Scientists and Engineers

11. In an uncertain security landscape with new emerging threats, we face the constant challenge of preparing and equipping our SAF to meet future operational needs. There are many new frontiers that we can explore: How can autonomous systems be used to keep our soldiers safe or safer? What kind of opportunities can outer space offer us? How can cyber domains be more secure as our systems become increasingly digitalised and inter-connected? While some of the challenges are clear, finding the right solutions may not be so straightforward.

12. All of you here have a role to play, and you are talented. I think you carry this responsibility

as we continue in this journey of scaling new heights and finding better ways to defend our country. This is especially so in the face of our internal resource constraints, as well as the increasingly complex external threats.

13. The YDSP has been a meaningful platform for nurturing the next generation of young defence scientists and engineers. In fact, there are many YDSP alumni among the DTC, who have risen to the challenge of leveraging technology to enhance our defences.

14. Back in in 2006, we have Mr Shiah Zi Chao who was part of the YDSP then and he attended the Science & Technology camp. That camp sparked his interest to pursue an engineering career, and eventually led to his decision to take up the DSTA Scholarship to study Electrical and Electronic Engineering in Imperial College London. Today, Zi Chao is part of DSTA's Cybersecurity Data Analytics team, and he uses Artificial Intelligence and machine learning to detect potential cyberattacks on our systems.

15. Another YDSP alumnus is Mr Ng Ping Liang. He first encountered defence engineering at the World of Science programme during his secondary school days. Under Research@YDSP, he furthered his interest through working on a project on thermoelectric generation for system heat recovery. As a secondary student then, he found the experience invaluable and eye-opening and I assume, fun. The YDSP inspired him to explore a technical career, and eventually led to his decision to take up the DSTA Scholarship to study Physics at the University of Cambridge. Ping Liang is currently a Defence Research Engineer with the Electronic Systems Division at DSO, exploring the use of machine learning to process communication signals. He finds meaning in his work as he knows his contribution plays a part in building up our nation's defence capabilities.

16. This is indeed an exciting time to immerse yourselves in the field of Science, Technology, Engineering and Mathematics or STEM, where you can dream big, be creative and challenge the conventional to make things better. Discovering science and technology is a journey that goes beyond the theoretical – it challenges your understanding and encourages you to look at the applications, to look at how all this knowledge and technologies can then be plugged to real-life problems.

17. With this in mind, the various YDSP activities have been designed to allow you to learn by applying your knowledge, and exercising your imagination and resourcefulness. I hope that your experiences in the YDSP have inspired you to the possibilities of science and technology, and to consider future opportunities to join the ranks of our defence engineers and scientists in keeping our country safe.

18. My heartfelt congratulations to our 59 YDSP and DSTA Junior College Scholarship recipients, as well as all participants for successfully completing your YDSP journey. You have gained hands-on insights in a wide array of new technology domains ranging from outer space, data analytics, to artificial intelligence. Many promising and novel ideas have emerged from the programme. I am confident that your passion and desire to challenge and stretch the limits of science and

technology will one day allow you to play a part to shape Singapore's exciting future.

19. I heard that two of our Research@YDSP students, Haohui and Natalie, have received Gold awards at this year's Singapore Science and Engineering Fair (SSEF), for their projects on using Data Analytics for "Fake News" Detection and Origami Paper Parachute respectively. So congratulations to them! They will represent Singapore at the International Science and Engineering Fair this May in Phoenix, Arizona, USA. This is quite a feat as this event is regarded as the Olympics of Science Competitions, and only six out of 320 SSEF projects were selected to represent Singapore. I look forward to learning more about these projects and others at the exhibition later.

20. I would also like to express my appreciation to everyone who has rendered your kind support to the YDSP, making this programme an enriching learning experience for all our participants.

21. Thank you once again for this privilege to be with you and I wish you all a pleasant afternoon.

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