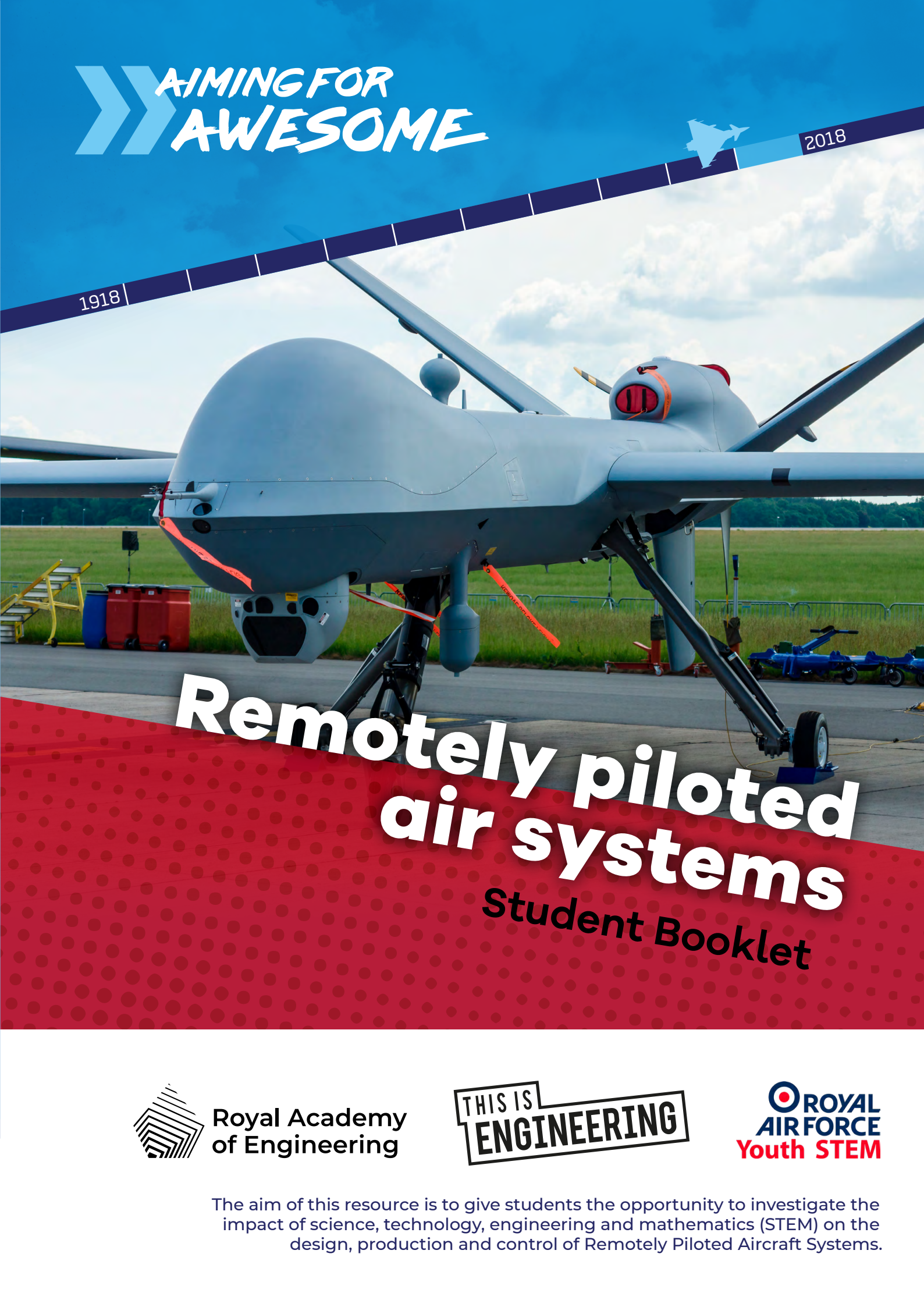


AIMING FOR
AWESOME

2018

1918



Remotely piloted air systems

Student Booklet



Royal Academy
of Engineering

THIS IS
ENGINEERING

ROYAL
AIR FORCE
Youth STEM

The aim of this resource is to give students the opportunity to investigate the impact of science, technology, engineering and mathematics (STEM) on the design, production and control of Remotely Piloted Aircraft Systems.



Unmanned vehicles

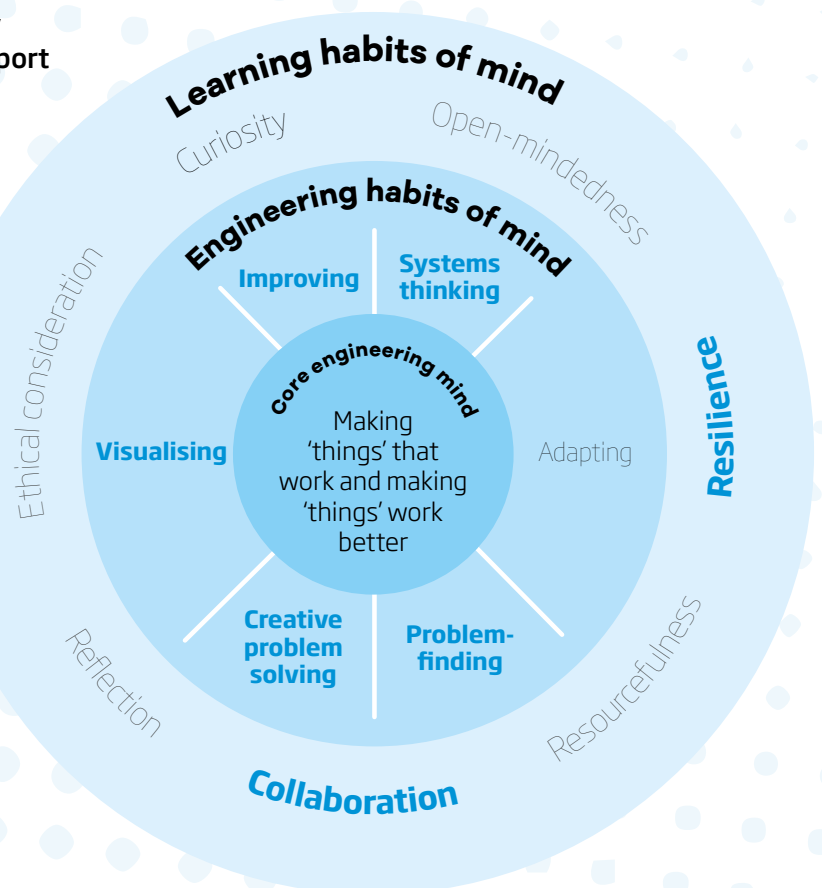
Unmanned vehicles are becoming increasingly common, with driverless pods at Heathrow airport that transport passengers between terminals and self-driving cars due to hit roads by 2020.

Unmanned vehicles are not just confined to the roads though, they can be designed to travel across any terrain, even if it is unreachable or dangerous to humans.

This allows us to explore more and previously unreachable areas of the world, and the universe. Unmanned vehicles have been used to research the deepest depths of the oceans and the furthest reaches of the solar system.

In 2005 the RAF began to use remotely piloted air systems (RPAS) when a new unit, No. 1115 Flight, was formed at Creech Air Force Base in Nevada. The squadron has now relocated to RAF Waddington in Lincolnshire.

As of March 2009, the squadron operated 12 three-man teams to pilot its Reaper aircraft, supporting intelligence specialists, information communications technicians, signallers, and meteorologists.



TIME TO THINK

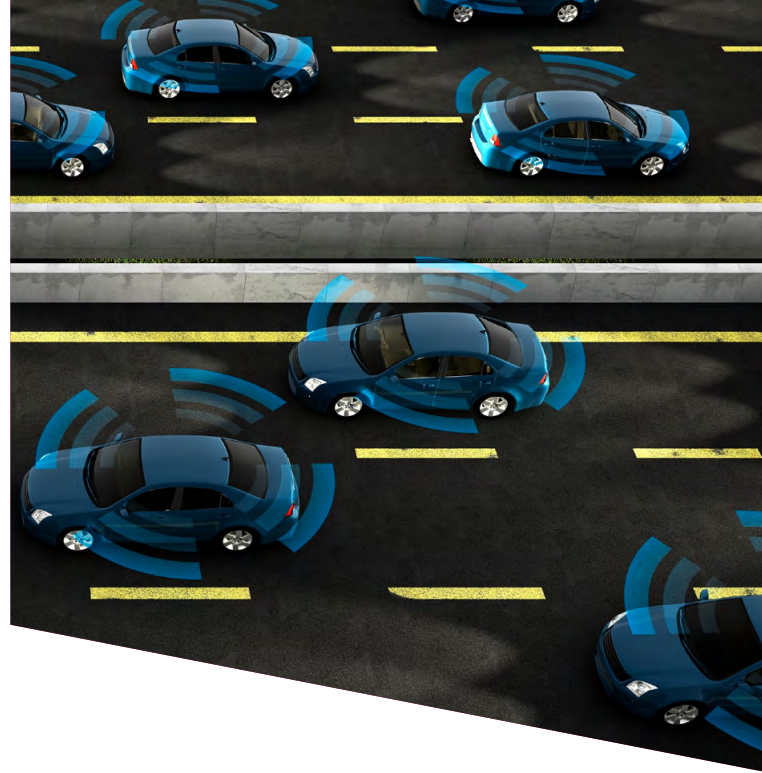
Self-driving cars move autonomously. The vehicles have a variety of sensors, such as radar, lasers and GPS to navigate their surroundings without a driver.

Advanced control systems interpret the information to identify the best route to take, as well as obstacles in the road.

Automated cars permitted on public roads are not yet fully autonomous. They all require a human driver at the wheel who is ready to take control of the vehicle at a moment's notice.

Do you think self-driving cars are a good or bad idea?

In pairs, come up with three positives and three concerns about self-driving cars.



Positives

Negatives

Positives	Negatives

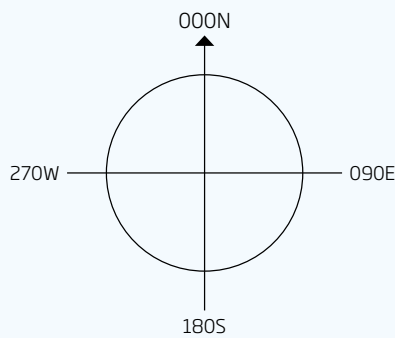


TIME TO INVESTIGATE

You need to write a flight plan for the RPAS to get from base to landing strip A.

To avoid being detected you must not fly over radar towers. Which of the three programmes below should you use?

In these flight plans the aircraft is told which direction to travel in using bearings. For example, if the flight plan says "turn to 090" the aircraft should turn to face east.



Flight plan A	Flight plan B	Flight plan C
Turn to 180	Turn to 090	Turn to 000
Move forward one square	Move forward five squares	Move forward three squares
Turn to 090	Turn to 000	Turn to 090
Move forward five squares	Move forward two squares	Move forward three squares
Turn to 000	Turn 090	Turn to 180
Move forward two squares	Move forward one square	Move forward one square
Turn to 090		Turn to 090
Move forward one square		Move forward three squares

Can you write a simpler flight plan to get to landing strip A?

You have been given the following flight plan to fly the RPAS from landing strip A to landing strip B, however there is a problem with the plan.

The flight plan now tells the aircraft how many degrees to turn. The aircraft starts by facing east. Debug the flight plan so that the RPAS can land safely on landing strip B.

Flight Plan

- Turn 090
- Move forward three squares
- Turn -090
- Move forward two squares
- Turn 090
- Move forward one square



STRETCH AND CHALLENGE

The RPAS you are responsible for is stationed at landing strip A. Your challenge is to write a flight plan to deliver aid to a village at B and return to base.

In pairs, test each other's flight plans.

Are your flight plans the same? If not, which flight plan is more efficient?

Three support sheets are displayed, each with a blue header and the 'AIMING FOR AWESOME' logo. The first sheet, 'Support sheet 1', shows a grid map with a north arrow, a starting point 'A', and a destination 'B'. The second sheet, 'Support sheet 2', shows a hexagonal grid map with a north arrow and various icons representing different terrain or obstacles. The third sheet, 'Support sheet 3', shows a collection of airplane icons in various orientations, some within dashed circles.





Royal Academy of Engineering

The Royal Academy of Engineering is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public.

Together we're working to tackle the greatest challenges of our age.

What we do

Talent & diversity

We're growing talent by training, supporting, mentoring and funding the most talented and creative researchers, innovators and leaders from across the engineering profession.

We're developing skills for the future by identifying the challenges of an ever-changing world and developing the skills and approaches we need to build a resilient and diverse engineering profession.

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We're driving innovation by investing in some of the country's most creative and exciting engineering ideas and businesses.

We're building global partnerships that bring the world's best engineers from industry, entrepreneurship and academia together to collaborate on creative innovations that address the greatest global challenges of our age.

Policy & engagement

We're influencing policy through the National Engineering Policy Centre – providing independent expert support to policymakers on issues of importance.

We're engaging the public by opening their eyes to the wonders of engineering and inspiring young people to become the next generation of engineers.



The RAF Youth STEM programme is designed to engage and inspire young people by building their interest in engineering and technical career pathways.

From cyber specialists to aerospace, aviation, electronics, and mechanical disciplines, the RAF is committed to widening participation in STEM, extending opportunities to all, and encouraging greater diversity in this critical area of national skills shortages.

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