



Aviation Decarbonisation



Lesson PDF Book

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Aviation Decarbonisation: Sustainable Aviation Fuel

Reading Test

EXAMPLE

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Student

Time: *Approximately 1 hour*

Two types of lesson

Lesson#1: [Easy] ***** [B2/C1]

1. Predict the content of the text by reading the title. Write down the key terms & ideas.
2. Read the text. Check the unknown words with a dictionary.
3. Answer the comprehension questions.
4. Check your answers with the provided key (pass mark is 70%).

Lesson #2: [Hard] ***** [C1]

1. Read the text without looking up any words.
2. Answer the comprehension questions.
3. Check your answers with the provided key (pass mark is 70%).

Teacher

Two types of lesson

Lesson#1: [easy] ***** [B2/C1]

1. Distribute **text 1 (without reference words underlined)** a week before the test. Students read, check vocabulary & meanings.
2. Test day. Distribute **text 2 (with reference words underlined)** & the **questions** (no dictionary or notes).
3. Set 1 hour to read the text & answer the questions.
4. Take in & correct or go through answers in class (pass mark is 70%).
5. Extra activity. Students write the *summary (add 30 minutes to the test).

Lesson #2: [hard] ***** [C1]

1. Test day. Distribute **text 2 (with reference words underlined)** & the **questions**.
2. Set 1 hour to read the text & answer the questions.
3. Take in & correct or go through answers in class (pass mark is 70%).
4. Extra activity. Students write the *summary (add 30 minutes to the test).

*Summary writing: www.academic-englishuk.com/summary

Aviation Decarbonisation: Sustainable Aviation Fuel (Text 1)

By C. Wilson (2022) EXAMPLE

Aviation today plays a key role in the size and state of [redacted] important in keeping people connected across the world. However, as we continue to travel more and [redacted] as seen in the \$3.5tn of the world's GDP it represents, global carbon emissions as a result of air [redacted] could [redacted] (Vigeveno, 2021). According to Moyes (2021), as a return flight from London to San Francisco has [redacted] CO₂e, coupled with the fact that the number of passengers travelling by plane is predicted to reach 8 [redacted] in aviation [redacted] as the overall aim of net zero by 2050 (Department for Transport, 2021) must be achieved if we are to [redacted] aviation.

One of the most effective [redacted] sustainable aviation fuel (SAF). According to the Department for Transport (2021), advocates for SAF believe it to be the [redacted] represent [redacted] yet are accountable for over 60% of UK aviation emissions. Furthermore, Moyes (2021) reports that [redacted], customers are beginning to not only recognise the benefits of SAF in terms of emission reductions, [redacted] paying extra for flights which use it. As roughly 200 corporations represent 16% of global air [redacted] as the Low-Carbon Fuel Standard, whereby tradable credits are awarded to the fuel suppliers, [redacted], (2021), [redacted] encouraged to commit to funding SAF, the less costly flights will be long-term. To achieve this, [redacted] increase the production and supply of SAF through more financial incentives and funding. This [redacted]. This [redacted] and creates economic prosperity, thanks to the annual £700m to £1.6bn in Gross Value Added ([redacted] 2021).

SAF, also known as bio-jet, is a low carbon alternative produced from a variety of sustainable [redacted] include [redacted] municipal household and business waste such as packaging, paper and textiles, forestry residue, which includes [redacted] containing lipid oils, and halophytes such as algae (Moyes, 2021; CPP, 2021). As SAF is similar [redacted] fuel, [redacted] without any major modifications, making it a safe 'drop in' option for all types of aircraft, which [redacted] to its [redacted] an aircraft's hourly fuel burn, but also leads to a 70% fall in carbon dioxide emissions and a significant decrease in both particulate [redacted] Transport, 2021; CPP, 2021).

Nevertheless, as SAF currently constitutes less than 0.1% of the [redacted] every year, its [redacted] reach eight times higher (Vigeveno, 2021). This is largely due to the low availability of sustainable feedstocks, as well as [redacted], which [redacted]

limited demand and to that of traditional jet fuel (Moyes, 2021). There is also growing concern regarding how SAF have accused them of greenwashing, that is to say, misleading the public into thinking the to make SAF, such as sugarcane and palm oil, cause damaging consequences such as deforestation, (, 2021).

Therefore, although SAF is not completely free of carbon emissions, it causes considerably fewer that increasing production of SAF a viable option. Vigeveno (2021) argues for the introduction of 'blending mandates' which determine that a specific amount jet fuel, whereas Moyes (2021) claims that more research, development and marketing of innovative sustainable governments to encourage investment from stakeholders in technologies which process feedstocks more efficiently would go some way to n the increase in emissions.

Reference list

(CPP), (2021). [online].

Available at: <https://compareprivateplanes.com/articles/sustainable-aviation-fuel-saf-> [Viewed 28.06.2022].

Department for Transport, (2021). [pdf]. Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002716/jet-zero-consultation-a-consultation-on-our-strategy-for-net-zero-aviation.pdf [Viewed 28.06.2022].

(2021). *Sustainable aviation fuel –* ?

Available at: <https://www.bp.com/en/global/air-bp/news-and-views/views/what-is-sustainable-aviation-fuel-saf.html> [Viewed 28.06.2022].

Shell Global, (2021). [online]. Available at:

https://www.shell.com/energy-and-innovation/the-energy-future/decarbonising-aviation.html?utm_source=&utm_medium=social_organic&utm_content [Viewed 28.06.2022].

Vigeveno, H., (2021). *Aviation's flight path to a net-zero future* [online]. Available at:

<https://www.weforum.org/agenda/2021/09/aviation-flight-path-to-net-zero-future/> [Viewed 28.06.2022].

Aviation Decarbonisation: Sustainable Aviation Fuel (Text 2)

By C. Wilson (2022)

1. Aviation today plays a key role in the size and state of [redacted] important in keeping people connected across the world. However, as we continue to travel more and [redacted] as seen in the \$3.5tn of the world's GDP it represents, global carbon emissions as a result of [redacted] could [redacted] (Vigeveno, 2021). According to Moyes (2021), as a return flight from London to San Francisco has [redacted] CO₂e, coupled with the fact that the number of passengers travelling by plane is predicted to reach 8 [redacted] in aviation [redacted] as the overall aim of net zero by 2050 (Department for Transport, 2021) must be achieved if we are to [redacted] aviation.

2. One of the most effective [redacted] sustainable aviation fuel (SAF). According to the Department for Transport (2021), advocates for SAF believe it to be the [redacted] represent [redacted] are accountable for over 60% of UK aviation emissions. Furthermore, Moyes (2021) reports that [redacted], customers are beginning to not only recognise the benefits of SAF in terms of emission reductions, [redacted] paying extra for flights which use it. As roughly 200 corporations represent 16% of global air [redacted] as the Low-Carbon Fuel Standard, whereby tradable credits are awarded to the fuel suppliers, [redacted], (2021), [redacted] encouraged to commit to funding SAF, the less costly flights will be long-term. To achieve **this**, [redacted] increase the production and supply of SAF through more financial incentives and funding. This [redacted] and creates economic prosperity, thanks to the annual £700m to £1.6bn in Gross Value Added ([redacted], 2021).

3. SAF, also known as bio-jet, is a low carbon alternative produced from a variety of sustainable [redacted] include [redacted] municipal household and business waste such as packaging, paper and textiles, forestry [redacted] containing lipid oils, and halophytes such as algae (Moyes, 2021; CPP, 2021). As SAF is similar [redacted] fuel, [redacted] without any major modifications, making **it** a safe 'drop in' option for all types of aircraft, which [redacted] to its [redacted] an aircraft's hourly fuel burn, but also leads to a 70% fall in carbon dioxide emissions and a significant decrease in both particulate [redacted] Transport, (2021; CPP, 2021).

4. Nevertheless, as SAF currently constitutes less than 0.1% of the [redacted] used every year, its [redacted] reach eight times higher (Vigeveno, 2021). **This** is largely due to the low availability of sustainable feedstocks, as well as [redacted], which [redacted] small quantities due to limited demand and [redacted]

to that of traditional jet fuel (Moyes, 2021). There is also [redacted] how [redacted] SAF have accused them of greenwashing, that is to say, misleading the public into thinking [redacted] the [redacted] to make SAF, such as sugarcane and palm oil, cause damaging consequences such as deforestation, [redacted] ([redacted], 2021).

5. Therefore, although SAF is not completely free of carbon emissions, [redacted] fewer [redacted] that increasing production of SAF a viable option. Vigeveno (2021) argues for the introduction of 'blending mandates' which [redacted] amount [redacted] jet fuel, whereas Moyes (2021) claims that more research, development and marketing of innovative sustainable [redacted] governments to encourage investment from stakeholders in technologies which process feedstocks more efficiently [redacted] to [redacted] the increase in emissions.

Reference list

[redacted] (CPP), (2021). [redacted] [online]. Available at: <https://compareprivateplanes.com/articles/sustainable-aviation-fuel-saf> [Viewed 28.06.2022].

Department for Transport, (2021). [redacted] [pdf]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002716/jet-zero-consultation-a-consultation-on-our-strategy-for-net-zero-aviation.pdf [Viewed 28.06.2022].

[redacted] (2021). *Sustainable aviation fuel – [redacted]?* Available at: <https://www.bp.com/en/global/air-bp/news-and-views/views/what-is-sustainable-aviation-fuel-saf.html> [Viewed 28.06.2022].

Shell Global, (2021). [redacted] [online]. Available at: https://www.shell.com/energy-and-innovation/the-energy-future/decarbonising-aviation.html?utm_source=&utm_medium=social_organic&utm_content [Viewed 28.06.2022].

Vigeveno, H., (2021). *Aviation's flight path to a net-zero future* [online]. Available at: <https://www.weforum.org/agenda/2021/09/aviation-flight-path-to-net-zero-future/> [Viewed 28.06.2022].

Comprehension Questions

1. Headings: Choose a subheading for each paragraph. One title is not needed.

| | | | |
|---|--------------------|---|---|
| 1 | <i>C (example)</i> | A | The [redacted] sustainable aviation fuel (SAF) |
| 2 | | B | The ethics of sustainable aviation fuel (SAF) |
| 3 | | C | [redacted] |
| 4 | | D | The way ahead for sustainable aviation fuel (SAF) |
| 5 | | E | The [redacted] sustainable aviation fuel (SAF) |
| | | F | The source of sustainable aviation fuel (SAF) |

___ / 4

2. True / False / Not Given: One question per paragraph.

| | | T / F / NG |
|--------------------|---|--------------------|
| Paragraph 1 | | |
| 0. | <i>In the next three decades, global carbon emissions could increase by 3%. (could increase by another 20% in the next 30 years).</i> | <i>F (example)</i> |
| Paragraph 1 | | |
| i. | 8 billion people will [redacted] century. | |
| Paragraph 2 | | |
| ii. | Some consumers [redacted] use SAF. | |
| Paragraph 3 | | |
| iii. | Some [redacted] own SAF and [redacted] fuel. | |
| Paragraph 4 | | |
| iv. | The price of SAF has an [redacted] jet fuel. | |
| Paragraph 5 | | |
| v. | SAF is a good [redacted] as it is carbon free. | |

___ / 5

3. Reference Words: What do these words connect to? (underlined in the text).

| Paragraph | Word | Connection |
|-----------|------------|----------------------------|
| 1 | <i>It</i> | <i>Aviation (example).</i> |
| 1 | It | |
| 2 | [redacted] | |
| 2 | This | |
| 3 | [redacted] | |
| 3 | It | |
| 4 | This | |
| 4 | [redacted] | |
| 5 | Which | |

___ / 8

4. Open Answer Questions: One question per paragraph.

| | |
|--------------------|---|
| Paragraph 1 | |
| i. | What TWO targets must be achieved to reduce the environmental impact from aviation? |
| | 1. <i>78% reduction in emissions by 2035 (example).</i> 2. |
| Paragraph 2 | |
| ii. | What TWO things can be done to _____ of SAF? |
| | 1. 2. |
| Paragraph 3 | |
| iii. | What are TWO of the _____ fuel? |
| | 1. 2. |
| Paragraph 4 | |
| iv. | Why might SAF _____ environmentally friendly? |
| | |
| Paragraph 5 | |
| v. | What would Vigeveno (2021) like to _____ ? |
| | |

___ / 7

5. Citations: Match the author/organisation with the point they make about SAF.

| | Reference | | Point |
|------|-------------------------------|----|---|
| i. | <i>Moyes (2021) (example)</i> | a. | Companies _____ up to certain schemes. |
| ii. | Vigeveno (2021) | b. | An SAF _____ job opportunities. |
| iii. | Dept. for transport (2021) | c. | Supporters of SAF could be misleading the public. |
| iv. | CPP (2021) | d. | Separate storage tanks will be needed at airports. |

| | | | | | | | |
|----|--------------------|-----|--|------|--|----|--|
| i. | <i>d (example)</i> | ii. | | iii. | | iv | |
|----|--------------------|-----|--|------|--|----|--|

___ / 3

6. Key language: Search for the word in the paragraph that means:

| Paragraph | Explanation | Word |
|-----------|--|----------------------------|
| 1 | <i>The act of sending out gas.</i> | <i>Emissions (example)</i> |
| 1 | Increasing in quantity by one addition after another. | |
| 2 | To _____ cause. | |
| 2 | A thing that encourages a person to do something. | |
| 3 | Based _____ or believed. | |
| 3 | A change to something. | |
| 4 | Behaviour that makes the general population think that it is doing _____ it really is. | |
| 4 | A situation in which something is in short supply. | |
| 5 | This _____ intended. | |
| 5 | Using new methods or ideas. | |

___ / 9

Overall Total: ___ / 36



Aviation Decarbonisation

Reading to Writing Summary

EXAMPLE

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Student

Two types of lesson

Lesson#1: [Easy] **** [B2/C1]

1. Predict the content of the text. Write down key terms & ideas.
2. Read the text & check words & meanings with a dictionary.
3. Identify the key points and supporting details and complete the **outline**.
4. Write a one-paragraph summary of 200-250 words.
5. Check key points with the **completed outline** & **model answer** (try to achieve 4 key points and 4 supporting points).
6. Answer the critical thinking questions & check possible answers.

Lesson #2: [Hard] **** [C1]

1. Read the text – no dictionary.
2. Identify the key points and supporting details and complete the **outline**.
3. Write a one-paragraph summary of 200-250 words.
4. Check key points with the **completed outline** & **model answer** (try to achieve 4 key points and 4 supporting points).
5. Answer the critical thinking questions & check possible answers.

Teacher

Two types of lesson

Lesson#1: [easy] **** [B2/C1]

1. Distribute the text a week /day before the test. Students read, check vocabulary & meanings.
2. Test day: distribute a **new copy of text** and the **summary question**.
3. Set 1 hour to read the text, take notes and write a one-paragraph summary of 200-250 words.
4. Feedback¹: take in and mark [[use our correction code*](#)].
5. Feedback²: distribute **completed outline** & **model answer**. Students compare with their own work.
6. Summary marking: **should contain at least 4 main ideas with support** – see **summary key points**.
7. Extra: critical thinking questions / group discussion (30 minutes).

Lesson #2: [hard] **** [C1]

1. Set 1 hour to read the **text** and write a one-paragraph summary of 200-250 words.
3. Feedback¹: take in and mark [[use our correction code*](#)].
4. Feedback²: distribute **completed outline** & **model answer**. Students compare with their own work.
5. Summary marking: **should contain at least 4 main ideas with support** – see **summary key points**.
6. Extra: critical thinking questions / group discussion (30 minutes).

Correction code*: www.academic-englishuk.com/error-correction

Aviation Decarbonisation: Sustainable Aviation Fuel

By C. Wilson (2022) **EXAMPLE**

Aviation today plays a key role in the size and state of [REDACTED] important in keeping people connected across the world. However, as we continue to travel more and [REDACTED] as seen in the \$3.5tn of the world's GDP it represents, global carbon emissions as a result of air [REDACTED] could [REDACTED] (Vigeveno, 2021). According to Moyes (2021), as a return flight from London to San Francisco has [REDACTED] CO₂e, coupled with the fact that the number of passengers travelling by plane is predicted to reach 8 [REDACTED] in aviation [REDACTED] as the overall aim of net zero by 2050 (Department for Transport, 2021) must be achieved if we are to [REDACTED] aviation.

One of the most effective [REDACTED] sustainable aviation fuel (SAF). According to the Department for Transport (2021), advocates for SAF believe it to be the [REDACTED] represent [REDACTED] yet are accountable for over 60% of UK aviation emissions. Furthermore, Moyes (2021) reports that [REDACTED], customers are beginning to not only recognise the benefits of SAF in terms of emission reductions, [REDACTED] paying extra for flights which use it. As roughly 200 corporations represent 16% of global air [REDACTED] as the Low-Carbon Fuel Standard, whereby tradable credits are awarded to the fuel suppliers, [REDACTED], (2021), [REDACTED] encouraged to commit to funding SAF, the less costly flights will be long-term. To achieve this, [REDACTED] increase the production and supply of SAF through more financial incentives and funding. This [REDACTED]. This [REDACTED] and creates economic prosperity, thanks to the annual £700m to £1.6bn in Gross Value Added ([REDACTED] 2021).

SAF, also known as bio-jet, is a low carbon alternative produced from a variety of sustainable [REDACTED] include [REDACTED] municipal household and business waste such as packaging, paper and textiles, forestry residue, which includes [REDACTED] containing lipid oils, and halophytes such as algae (Moyes, 2021; CPP, 2021). As SAF is similar [REDACTED] fuel, [REDACTED] without any major modifications, making it a safe 'drop in' option for all types of aircraft, which [REDACTED] to its [REDACTED] an aircraft's hourly fuel burn, but also leads to a 70% fall in carbon dioxide emissions and a significant decrease in both particulate [REDACTED] [REDACTED] Transport, (2021; CPP, 2021).

Nevertheless, as SAF currently constitutes less than 0.1% of the [REDACTED] every year, its [REDACTED] reach eight times higher (Vigeveno, 2021). This is largely due to the low availability of sustainable feedstocks, as well as [REDACTED], which [REDACTED]

limited demand and to that of traditional jet fuel (Moyes, 2021). There is also growing concern regarding how SAF have accused them of greenwashing, that is to say, misleading the public into thinking the to make SAF, such as sugarcane and palm oil, cause damaging consequences such as deforestation, (, 2021).

Therefore, although SAF is not completely free of carbon emissions, it causes considerably fewer that increasing production of SAF a viable option. Vigeveno (2021) argues for the introduction of 'blending mandates' which determine that a specific amount jet fuel, whereas Moyes (2021) claims that more research, development and marketing of innovative sustainable governments to encourage investment from stakeholders in technologies which process feedstocks more efficiently would go some way to n the increase in emissions.

Reference list

(CPP), (2021). [online]. Available at: <https://compareprivateplanes.com/articles/sustainable-aviation-fuel-saf-> [Viewed 28.06.2022].

Department for Transport, (2021). [pdf]. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002716/jet-zero-consultation-a-consultation-on-our-strategy-for-net-zero-aviation.pdf [Viewed 28.06.2022].

(2021). *Sustainable aviation fuel –* ? Available at: <https://www.bp.com/en/global/air-bp/news-and-views/views/what-is-sustainable-aviation-fuel-saf.html> [Viewed 28.06.2022].

Shell Global, (2021). [online]. Available at: https://www.shell.com/energy-and-innovation/the-energy-future/decarbonising-aviation.html?utm_source=&utm_medium=social_organic&utm_content [Viewed 28.06.2022].

Vigeveno, H., (2021). *Aviation's flight path to a net-zero future* [online]. Available at: <https://www.weforum.org/agenda/2021/09/aviation-flight-path-to-net-zero-future/> [Viewed 28.06.2022].

Summary: Key Points

Take notes on the key points of the text.

| |
|---------------|
| 1. Main idea: |
| Support: |
| 2. Main idea: |
| Support: |
| 3. Main idea: |
| Support: |
| 4. Main idea: |
| Support: |
| 5. Main idea: |
| Support: |

Summary: Key Points (ANSWERS)

Take notes on the key points of the text.

| |
|--|
| <p>1. Main idea: The costs of aviation</p> <p>Support:</p> <ul style="list-style-type: none"> • Aviation = key role in glob. econ. Wrld's GDP = \$3.5tn. • Glob. carb. [redacted] (Vigevano, 2021). • Ret. flight frm London to San Francisco = carb. ftprint almost 1 tonne of Coe (Moyes, 2021). • No. pass [redacted] 2050. • Targets: [redacted] by 2050 (Dept. For Trans., 2021) must be achieved. |
| <p>2. Main idea: The benefits of SAF</p> <p>Support:</p> <ul style="list-style-type: none"> • SAF = [redacted] (Dept. 4 transport, 2021). [redacted] = [redacted] air travel but > 60% of aviation emiss (ibid). • Cust. see benefits: [redacted] (Moyes, 2021). • Comp. sign up 2 'Low-Carbon Fuel Stand' = tradable creds awarded [redacted]. = helps [redacted] • Energy prov., gov. & fin. inst. ↑ prod. & supply of SAF thru > fin. incent. & fund. (Shell Global, 2021) [redacted] |
| <p>3. Main idea: The source of SAF</p> <p>Support:</p> <ul style="list-style-type: none"> • SAF (bio-jet) = [redacted] mats. = [redacted] biz waste, forestry res. & halophytes (Moyes, 2021; CPP, 2021). • [redacted] conv. [redacted]. • Fuel eff, 70% ↓ CO₂ & ↓ PM & SO₂ (Dept. 4 Trans., 2021; CPP, 2021). |
| <p>4. Main idea: The drawbacks of SAF</p> <p>Support:</p> <ul style="list-style-type: none"> • SAF = < 0.1% of the [redacted] jet fuel (Vigevano, 2021). • Sust. mats [redacted] airports → only [redacted] amounts prod. due 2 lmt demand & price (Moyes, 2021). • [redacted] - how green SAF is. SAF = [redacted] SAF causes dam. cons. (CPP, 2021). |
| <p>5. Main idea:</p> <p>Support:</p> <ul style="list-style-type: none"> • SAF not free of carbon, [redacted] (Vigevano, 2021). • '[redacted] mandates' = SAF + con. jet fuel (ibid). • + research, dev. & mrkting of innov. sustain [redacted] process feedstocks more eff. = ↑ SAF & ↓ in emiss. (Moyes, 2021). |

Summary

Task: Write a 200-250 word summary on the key features of the text.

Word Count: _____

Sample Summary: Aviation Decarbonisation

Although aviation is a key driver of global economic development, it is also one of the fastest-growing sources of greenhouse gas emissions (Vigevano, 2021), and [REDACTED] increase [REDACTED] sector needs to find a [REDACTED] to meet global targets (Department for Transport, 2021). One way of achieving this is to use [REDACTED] a low carbon [REDACTED] ecological resources. When combined [REDACTED] fuel efficiency [REDACTED] as [REDACTED] (Department for Transport, 2021; CPP, 2021). However, [REDACTED] (2021) argues [REDACTED] [REDACTED] fuel, Moyes (2021) [REDACTED] of SAF [REDACTED] as [REDACTED] as well as a lack of storage facilities at airports, and CPP (2021), argues that some SAF resources such as crops may not be so [REDACTED] impact of cultivation. In spite of this, Vigevano (2021) suggests using 'blending mandates', a [REDACTED], while Moyes (2021) argues for more [REDACTED] along with [REDACTED] invest in technologies that manufacture feedstocks better. Hence, both ways could stimulate the growth of [REDACTED]

Wordcount 244 with references.

Critical Thinking Questions

i) What's the stance of the author? What is the evidence for this?

[2 points]

ii) Is this a credible article? Yes /no – why?

[2 points]

iii) Highlight four ideas in the text you would use for an essay on: “Could sustainable aviation fuel (SAF) help to ?”

[4 points]

iv) Highlight two areas in the text that you question, disagree with or lack evidence.

[2 points]

Critical Thinking Questions

i) What's the stance of the author? What is the evidence for this?

The writer believes that the aviation industry needs to reduce its carbon footprint and that SAF could help to ensure that this is achieved. This is mentioned throughout the essay.

Examples:

- **One of the most effective ways** to reduce carbon emissions is currently the use of sustainable aviation fuel (SAF).
- **This would then lead to a booming** SAF industry that.....

ALL ANSWERS INCLUDED IN PAID VERSION...



Aviation Decarbonisation

Listening Test

Example

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Aviation Decarbonisation: Hydrogen Planes **EXAMPLE**

[listening test questions]

Author: S. Jackson

Date: 01/07/22

Time: 10.25

Level: **** [B1/B2/C1]

Download Links

| | | |
|---|---|--|
| Lecture: Available in paying download | MP3: Available in paying download | PowerPoint: Available in paying download |
|---|---|--|

Check these words and phrases before listening:

Key vocabulary

1. Aviation.
2. Hydrogen.
3. Carbon [REDACTED].
4. To trial something.
5. Profound.
6. [REDACTED].
7. Sustainable sources.
8. [REDACTED].
9. To relieve.
10. [REDACTED].
11. Lithium-ion battery.
12. [REDACTED].
13. Methane.
14. Petroleum refinery.
15. [REDACTED].
16. Catalyst.
17. Renewable sources.
18. [REDACTED].
19. To be derived from something.
20. [REDACTED].
21. Water vapour.
22. [REDACTED].
23. Commercially competitive.
24. Capital-intensive industry.
25. [REDACTED].

Teacher

LISTENING TEST QUESTIONS

Aim: to develop the students' ability to listen to a 10 min+ lecture, to take notes and then use those notes to answer a range of test-type questions.

Lesson Time: Approximately 1:30-2:00 hours

Lesson Plan

Lead in

- Ask Students to read the 'title' & predict the content of the lecture.
- Ask students to write down key terms & language from the discussion.
- Feed in / check key vocabulary.

Three types of lesson

Lesson#1: [hard]

1. Students listen once & take notes.
2. Give 5 minutes to tidy notes.
3. Listen again & add to notes (use a different colour pen).
4. Distribute questions – set 20-25 minutes to answer.
5. Feedback: distribute or project answers.

Lesson #2: [medium]

1. Students listen once & take notes.
2. Distribute questions: set 15 minutes for students to answer the questions from their notes.
3. Listen again. Students answer the missed questions as they listen.
4. Give extra 10 minutes to consolidate answers.
5. Feedback: distribute or project answers.

Lesson #3: [easy]

1. Distribute questions. Students have 10 minutes to look at the questions.
2. Students listen & answer the questions.
3. Give 5 minutes to tidy answers.
4. Students listen again. Check answers & answer missed questions.
5. 5-10 minutes to tidy answers.
6. Feedback: distribute or project answers.

Full URL Links:

Video: [Available in paying download](#)

MP3: [Available in paying download](#)

PPT: [Available in paying download](#)

Aviation Decarbonisation: Hydrogen Planes

1. Overview of carbon emissions

1.1 What THREE aspects does [redacted] in?

| | |
|------|--|
| i. | |
| ii. | |
| iii. | |

___/3

1.2 Complete the table with the missing figures:

| | | |
|------|---|--|
| i. | Emissions have reduced more than half in the last.. | |
| ii. | SAF can [redacted] by.... | |
| iii. | Hydrogen can reduce emissions by.. | |
| iv. | Both can [redacted] global responsibility of up to..... by 2050 | |

___/4

2. Hydrogen Power: Select one answer per question only.

i. Compared to a lithium-ion battery, how much more energy per unit of mass can hydrogen store?

- a) 10 times.
- b) [redacted]
- c) 100 times.
- d) [redacted]

ii. What does steam-methane reforming separate?

- a) Hydrogen atoms from oxygen atoms.
- b) Hydrogen atoms from [redacted].
- c) Carbon atoms from oxygen atoms.
- d) [redacted] atoms.

iii. What [redacted] electrolysis?

- a) No by-products.
- b) [redacted]
- c) Hydrogen and water.
- d) [redacted]

iv. What is the energy [redacted] with Algae and Bacteria?

- a) Biomass gas.
- b) [redacted]
- c) Water.
- d) [redacted]

___/4

3. The reality of using hydrogen fuel: Are these statements true, false or not given?

| | | T/F/NG |
|------|--|--------|
| i. | Airbus is in the process of designing hydrogen fuelled planes for corporate use. | |
| ii. | Airbus will be [redacted] by 2045. | |
| iii. | A Boeing [redacted] passengers. | |
| iv. | Airbus will require fuel cells [redacted] | |
| v. | Hydrogen [redacted] by 2040. | |
| vi. | By 2050, [redacted] by hydrogen planes. | |

___ / 6

4. The FOUR challenges of using hydrogen power: Complete the table with an explanation of each challenge.

| | Challenge | Explanation |
|------|-------------------------|-------------|
| i. | Cost. | |
| ii. | How [redacted] fuel is. | |
| iii. | Infrastructure. | |
| iv. | [redacted] capacity. | |

___ / 4

5. Speaker's stance: What does the speaker question?

| | |
|----|--|
| i. | |
|----|--|

___ / 2

6. Conclusion: Complete the gaps in the paragraph with a word from the box:

| | | | | |
|---------------------|------------|-----------------|------------|--------------|
| considerably | [redacted] | aviation | [redacted] | costs |
|---------------------|------------|-----------------|------------|--------------|

Overall, it is clear that the _____ industry is trying to make _____ changes, but it seems [redacted] enough _____ in [redacted] unless _____ are brought down _____.

___ / 5

Total Score ___ / 28

Aviation Decarbonisation: Hydrogen Planes **ANSWERS**

1. Overview of carbon emissions

1.1 What THREE aspects does aviation play a key role in?

| | |
|------|--------------------------------------|
| i. | <i>Connecting people.</i> |
| ii. | <i>Transporting goods.</i> |
| iii. | <i>Supporting the local economy.</i> |

___/3

1.2 Complete the table with the missing figures:

| | | |
|----|---|------------------|
| | | |
| i. | Emissions have reduced more than half in the last.. | <i>30 years.</i> |

ALL ANSWERS ARE INCLUDED IN PAID VERSION...

Aviation Decarbonisation: Hydrogen Planes [Transcript]

Hello and welcome to today's lecture on Aviation Decarbonisation and we'll be specifically looking at hydrogen-powered Planes. I'll start the lecture today with a basic overview of aviation carbon emissions and highlight the two main alternatives to traditional aviation fuel. I'll then look at hydrogen energy and discuss how it is made. After that I'll discuss how the company Airbus is trialing hydrogen fuel technology with the hope to start commercial flights by 2035. This will then follow by looking at the challenges of implementing hydrogen to become commercially competitive and I'll finish with a summary of my findings.

Ok, so let's start with an overview of carbon emissions. As aviation continues to play a key role in connecting people, transporting goods and supporting the global economy, there are worrying signs that unless significant changes

THE FULL TRANSCRIPT IS INCLUDED IN THE PAID VERSION...



Aviation Decarbonisation

Seminar Speaking

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Seminars

1. An overview of how a seminar works

- Students work together in groups of 4-6.
- Teachers provide a set of questions.
- Students discuss for 25-30 minutes (approx 5 mins per person).
- Students summarise the key points in the last 5 mins.
- Students CAN refer to their texts and notes.
- Teachers monitor and give feedback at the end.

2. Pre-seminar task

- Students:
 - i. Take notes on the reading text and lecture.
 - ii. Predict question types and practice formulating answers.
 - iii. Work with a partner to practice asking and answering questions about the texts.
- ◆ **Differentiation (low levels): distribute questions for students to prepare in advance.**

3. The seminar

- The group are called into a room and they sit around a table.
- The questions are given out and students have 2 minutes to read and prepare by taking notes.
- The seminar begins with an opening statement – *we're here today to discuss...*
- The students then begin to discuss the first question.
- Each student should make a contribution by referring to their notes / texts.
- The seminar should flow with students adding to what was previously said.
- Once everyone agrees the question has been addressed in full, then they move onto the next question.
- **Important:** not all the questions have to be answered but they should be discussed in order.
- Once the students begin to approach 25 minutes, they should bring it to an end by each one summarising a main point raised.

4. Points to remember

- It should be a flowing conversation with everyone involved and contributing.
- The teacher / tutor should not intervene if it goes quiet but let the students manage the discussion.
- Students have to show confidence and demonstrate thorough awareness of the texts.
- Dominant students are penalised for not sharing and including others.
- Students should be penalised for just reading notes.
- Key debate phrases should be used to show conversation skills - agreeing, disagreeing, interrupting, etc...

Seminar Questions

Key sources:

Reading: [Wilson \(2022\)](#)

Compare Private Planes (CPP) (2021); Department for Transport (2021); Moyes (2021); Shell Global (2021); Vigeveno (2021).

Lecture: [Jackson \(2022\)](#)

Airbus (2022); BP (2022); Henderson (2021); O'Callaghan (2020); Office of Energy Efficiency and Renewable Energy, (n.d.); Shell (2022); The Economist (2021).

1. Define aviation decarbonisation.
2. Discuss sustainable aviation fuel (SAF) and its benefits over traditional aviation jet fuel.
3. Discuss hydrogen power and its benefits over traditional aviation jet fuel.
4. What are the main challenges of SAF and hydrogen power?
5. Which one (SAF or hydrogen power) do you consider to be the better alternative and why?
6. Do you think the aviation industry is doing enough to cut global emissions? (Why/why not?).
7. Apart from fuel, what other solutions are there for the aviation industry to cut emissions?
8. Critical thinking - is there anything in the lecture or text that you would question and/or disagree with?