JAF04 Unit 9 Technology in Use

Task 1 Speaking – Space elevator

- How do you think a space elevator would work?
- What could it be used for?
- What technical challenges would it face?
- How seriously do you think the concept of space elevators is being taken at present?

Task 2 Space elevators

a) Read the following extract, complete the gaps with suitable forms of the verbs in brackets and compare it to your answers in task 1.

Space elevators: preparing for takeoff

In his 1979 novel, *The Fountains of Paradise*, Arthur C. Clarke _____ (write) about an elevator connecting the earth´s surface to space. Three decades later, this science-fiction concept _____ (prepare) to take off in the real world. NASA _____ (launch) the Space Elevator Challenge, a competition with a generous prize fund, and several teams and companies _____ (work) on serious research projects aimed at winning it.

As its name suggests, a space elevator is designed _____ (raise) things into space. Satellites, components for space ships, supplies for astronauts in space stations, and even astronauts themselves are examples of payloads that could _____ (transport) into orbit without the need for explosive and environmentally unfriendly rockets. However, the altitude of orbital space – a colossal 35,790 km above the earth – is a measure of the challenge _____ (face) engineers. How could such a height _____ (reach)?

The answer is by _____ (use) an incredibly strong and lightweight cable, strong enough _____ (support) its own weight, and a heavy load. The design of such a cable is still largely theoretical. This would _____ (attach) to a base station on earth at one end and a satellite in geostationary orbit (fixed above a point on the equator) at the other. Lift vehicles would then ascend and descend the cable, _____ (power) by electromagnetic force and _____ (control) remotely.

b) Match the verbs (1-9) from the text to the definitions (a-i).

1 connecting	a) carried (objects, over a distance)
2 raise	b) hold something firmly
3 transported	c) climb down
4 support	d) provided with energy/ moved by a force
5 attached	e) joining
6 ascend	f) driven/ have movement directed
7 descend	g) fixed
8 powered	h) climb up
9 controlled	i) lift/ make something go up

c) James, an engineer, is giving a talk on space elevators. Complete his notes using the correct form of the verbs in exercise c. (Audio 1.2)

Space elevators

- Challenge of _____(1) a satellite to earth by cable is significant.
- To _____ (2) its own weight, and be securely _____ (3) at each end, cable would need phenomenal strength-to-weight ratio.
- How could vehicles be _____ (4) into space, by cable?
- Self-contained energy source problematic, due to weight (heavy fuel or batteries required to _____ (5) vehicle.)
- Two possible ways round problem:
  1. Transmit electricity wirelessly. But technique only at research stage.
  2. Solar power. But would only allow vehicle to _____ (6) slowly. Not necessarily a problem, as car could be controlled remotely, allowing it to _____ (7) payloads unmanned.

Listen to part of James´ talk and check your answers in the exercise above.

What kind of words are missing from the notes?

d) Some space elevator designs propose an offshore base station. What advantages might an offshore base have compared with a land base?

e) James goes on to discuss offshore base stations. Listen to the talk and answer the following questions. (Audio 1.3)

1. How would an offshore base station be supported?
2. How would payloads reach the base station?
3. What problem would a mobile base station help to prevent?
4. What would the procedure be if there was an alert?

f) You are members of a space elevator research team designing a concept for offshore base stations. In pairs, analyse the notes below, which were made during a briefing given by your manager. Imagine you are giving a presentation.

OFFSHORE BASE STATION – ANCHORING AND PROPULSION ISSUES

<u>Anchoring system</u>

Wind loads on cable will be huge. What implications for anchoring system?

Base will need to be moved continually, sometimes urgently. What system could be used to hold base in position?

Base in shallow water near coast, or deep water further offshore? Choice will have impact on design of anchor system.

<u>Propulsion system</u>

Will weight of cable allow base to be moved by own propellers? Or more powerful system for propulsion and control nec.? E.g. exter. power source?

g) In pairs, discuss the questions raised in the notes and think of some suitable solutions for the anchoring system and the propulsion system. At this stage, these should be overall concepts, not detailed designs.

(To read more about space elevators, go to: http://science.howstuffworks.com/space-elevator.htm)

Task 3 Vocabulary

a) Make opposites of the following words using the prefixes below. You can use some of them more than once.

ab- dis- im- in- ir- mal- over- un-

1. correct _____
2. undersized _____
3. adequate _____
4. detected _____
5. normal _____
6. sufficient _____
7. proportionate _____
8. regular _____
9. balance _____
10. function _____
11. operable _____
12. necessary _____
13. possible _____
14. competent _____
15. reliable _____
16. estimate _____
17. stable _____

b) Complete the following sentences using the words in ex. a. Sometimes more than one word is possible.

1. The temperature gauge was faulty. That´s why it was giving _____ readings.
2. The shaft was thinner than it should have been, so its strength was _____ .
3. The power output from the motor varies. We don´t understand why it´s _____.
4. The machine´s not working as it should. There´s some kind of _____ .
5. The braking force on both front wheels should be the same. There should not be an _____ .
6. The fault was _____ . None of the maintenance technicians had noticed it.
7. The control panel isn´t working, so you can´t control the machine. It´s totally _____ .

(adapted from Ibbotson, M. (2008). *Cambridge English for Engineering.* CUP.)