



雨树溶溶

英国最具影响力的青少年科普读物之一

(英)特莫鲍尔(Trumbauer, L.) 著
刘爱国 译

FIGHTER JET

空中勇士

【原子和分子】



哈尔滨工业大学出版社
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有些单词被印刷成粗体，**就像这样**。你可以在第30页中找到它们的意思，还可以在单词第一次出现时，在相关书页下方的方框内发现它们的含义。

Ready, jet, go!

预备，出击！

Look! Up in the sky! What is that thing zooming overhead? It is a special type of aeroplane. It is a fighter jet!

The army uses fighter jets. So does the air force. Fighter jets are used in battle. They can travel much faster than other planes. They can make sudden moves. They can make tight turns in the air. They are built to be very strong. Fighter jets are built to be better and faster than any other plane.

看那！空中呼啸而过的是什么？这是一种特殊的飞机——战斗机！

战斗机是用于战争的武器，供军队使用。它比其他飞机快多了。它可以突然加速，紧急转弯。和其他飞机相比，战斗机战斗力更强、性能更好、速度更快。

This fighter jet is an F-15. They ▶
are also called F-15 Eagles.

这是F-15战斗机，也称为F-15鹰式战斗机。

F-15 facts

F-15小常识

Type of jet: F-15

How fast can it go?

- 3017 kilometres (1875 miles) per hour

How high can it fly?

- 19812 metres (65000 feet)

How many people fly it?

- one or two

How wide is it from wing to wing?

- 13 metres (42.8 feet)

How long is it?

- 19.4 metres (63.8 feet)

机型: F-15

飞行速度多少?

- 每小时3017公里 (1875英里)

飞行高度多少?

- 19812米(65000英尺)

乘员数量?

- 一至两人

翼展多宽?

- 13米(42.8英尺)

长度多少?

- 19.4米(63.8英尺)



Everything matters

一切都很重要

Fighter jets are not simple machines. They have many parts. Some parts, such as the wings, help the plane fly up and down. Other parts help the plane steer. The engine gives the fighter jet the power to zoom forwards.

All these different parts have something in common. They are all made of **matter**. Matter is anything that takes up space. The form matter takes is called its **state**. Some matter is solid, such as wood. Some matter is liquid, such as water. Some matter is hard to see because it is a gas, such as air.

Most parts on a fighter jet are solid. Solids keep their shape. They only change shape when something changes them.

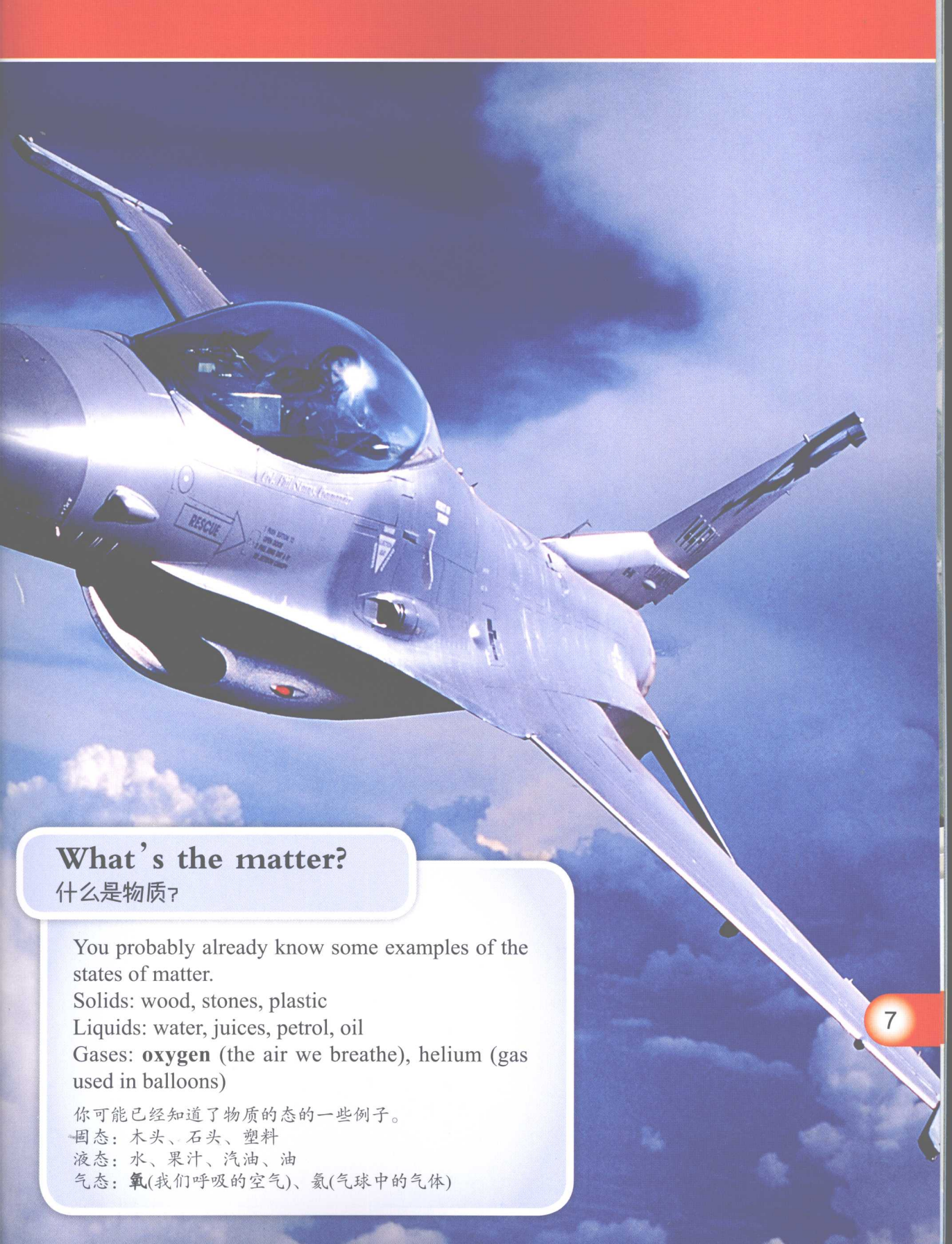
战斗机可不是简单的机器，它是由很多零部件组成的。有些零部件，例如机翼，用于飞机的起飞和降落；另一些零部件用于控制方向；而发动机用于提供战斗机飞行的动力。

所有这些各异的零部件有一个共同的特点，它们都是由**物质**构成的。物质可以占据空间。物质所处的状态称为物质的**态**。有些物质是固态的，例如木头；有些物质是液态的，例如水；有些物质很难看得见，因为它们是气态的，例如空气。

战斗机的大部分零部件都是固态的。固态物质可以保持形状，除非有外力作用改变它们的形状。

- Imagine you could tap the side of this fighter jet. What would it feel like? You cannot move your hand through it. The outside of a fighter jet is solid matter.

想像一下，如果轻轻地敲打这架战斗机的侧面，你碰到了什么？你的手不能穿过去，因为飞机的外蒙皮是固态物质。



What's the matter?

什么是物质?

You probably already know some examples of the states of matter.

Solids: wood, stones, plastic

Liquids: water, juices, petrol, oil

Gases: **oxygen** (the air we breathe), helium (gas used in balloons)

你可能已经知道了物质的态的一些例子。

固态: 木头、石头、塑料

液态: 水、果汁、汽油、油

气态: **氧**(我们呼吸的空气)、**氦**(气球中的气体)

Fuelled up

加油

Cars need **fuel** to make them go. So do fighter jets. Fighter jets use a special jet fuel. The jet fuel is liquid. Liquid is a **state** (form) of **matter**. Solids keep their shape. Liquids do not. A liquid's shape changes to fit the space it is in.

Like all liquids, the jet fuel's shape changes. First, the fuel is the shape of the fuel tank. Then, it flows into a hose. It becomes the shape of the hose. Finally, the fuel flows into the fighter jet's fuel tank. The fuel is now the shape of this fuel tank.

汽车需要**燃料**才能开动，战斗机也一样。战斗机用的是一种特殊的航空燃油，这种航空燃油是液态的。液态是**物质**的一种**态**。固体可以保持形状，而液体则不能。液体的形状会随着盛放它的容器的形状不同而改变。

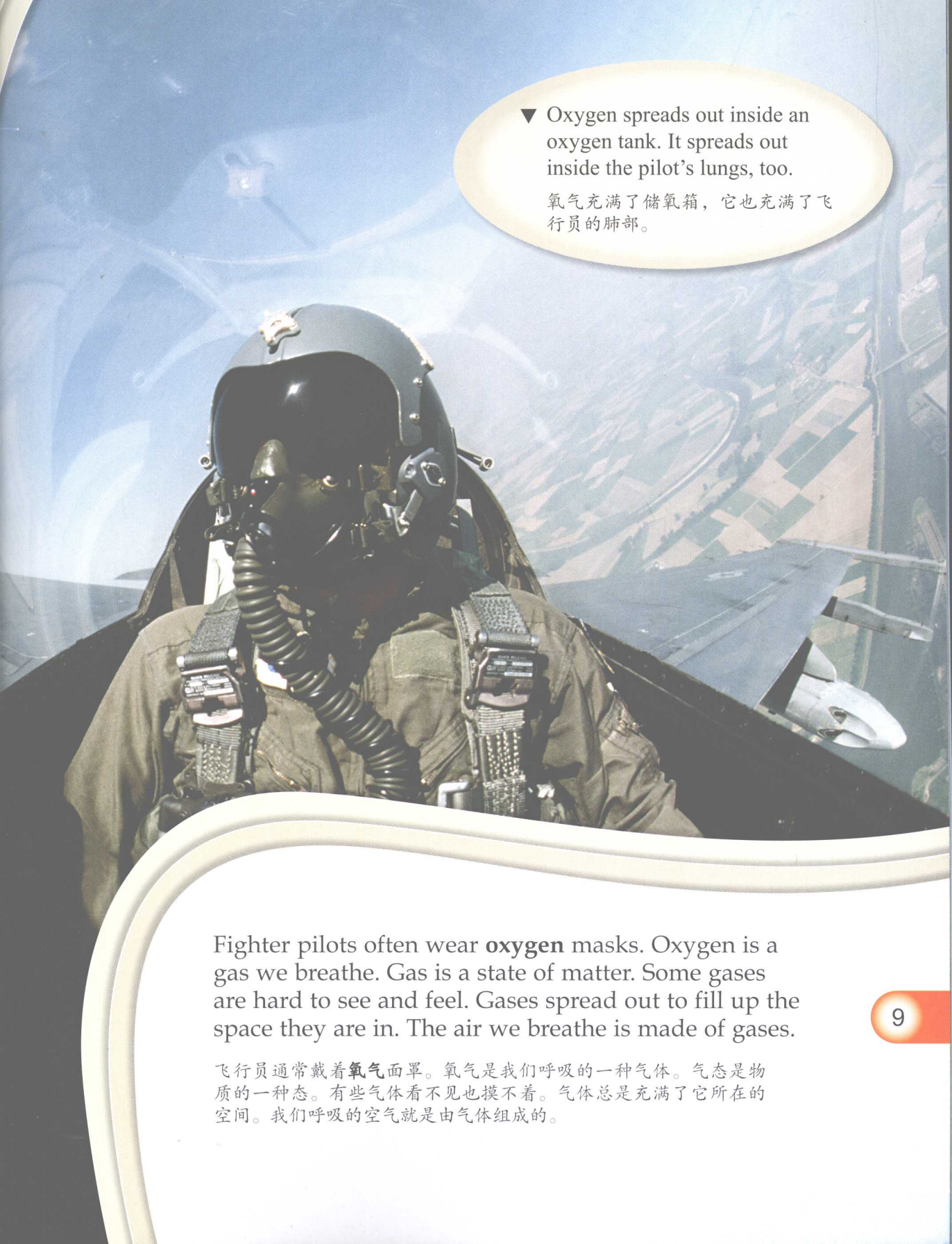
像所有的液体一样，这种航空燃油的形状也会改变。最开始，它的形状和燃料储箱是一样的。接下来，它流入加油软管，就变成了管子的形状。最后，它流入战斗机的燃料箱，变成了燃料箱的形状。

hose
加油管

A fighter jet uses up a lot of fuel when it flies at top speed. See the hose? This fighter jet is being refuelled in mid-air! ▶

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战斗机高速飞行时要消耗大量的燃油。看到加油管了吗？战斗机正在进行空中加油！



▼ Oxygen spreads out inside an oxygen tank. It spreads out inside the pilot's lungs, too.

氧气充满了储氧箱，它也充满了飞行员的肺部。

Fighter pilots often wear **oxygen** masks. Oxygen is a gas we breathe. Gas is a state of matter. Some gases are hard to see and feel. Gases spread out to fill up the space they are in. The air we breathe is made of gases.

飞行员通常戴着**氧气**面罩。氧气是我们呼吸的一种气体。气态是物质的一种态。有些气体看不见也摸不着。气体总是充满了它所在的空间。我们呼吸的空气就是由气体组成的。

Designing aeroplanes

设计飞机

When people make new things, they think about **matter**. They think about whether they can use solids, liquids, or gases.

They think about the **properties** (features) of matter. They think about how matter changes. For example, can a substance bend easily? Is it hard or soft? Does it break or burn? These are all properties of matter.

People think about matter when they **design** (make plans for) aeroplanes. The first fighter planes were flown during World War I (1914-1918). They were made of wood. Wood is hard. It cannot bend without breaking. However, wood burns easily. Burning easily is not good for a fighter plane!

当人们制造新东西时，会考虑所用的**物质**。人们会考虑是采用固体、液体还是气体。

人们会考虑物质的**性质**，以及这些物质会如何变化。例如，某种物质是否很容易弯曲？是软还是硬？是否会折断或燃烧？这些都是物质的性质。

当人们**设计**飞机的时候，就要对物质进行考虑。第一批战斗机是在第一次世界大战时(1914-1918)服役的，它们由木头制成。木头很硬，宁折不弯。但是，木头也很易燃，这对战斗机来说简直糟糕透顶！

Light weights

轻巧才飞得起来

Wood and cloth are not as strong as metal, but they are light. During World War I, aeroplane engines did not have a lot of power. So, planes could not be too heavy. A wooden aeroplane was light enough to fly.

木头和布没有金属强度高，但它们很轻。在一战期间，飞机发动机的功率还很小，因此飞机不能太重。木制的飞机很轻巧，能够飞得起来。

▼ The first fighter planes were made of wood and cloth. Cloth is a solid. It is a bendy solid.

第一批战斗机是由木头和布制成的。布是一种固体，但可以弯曲。

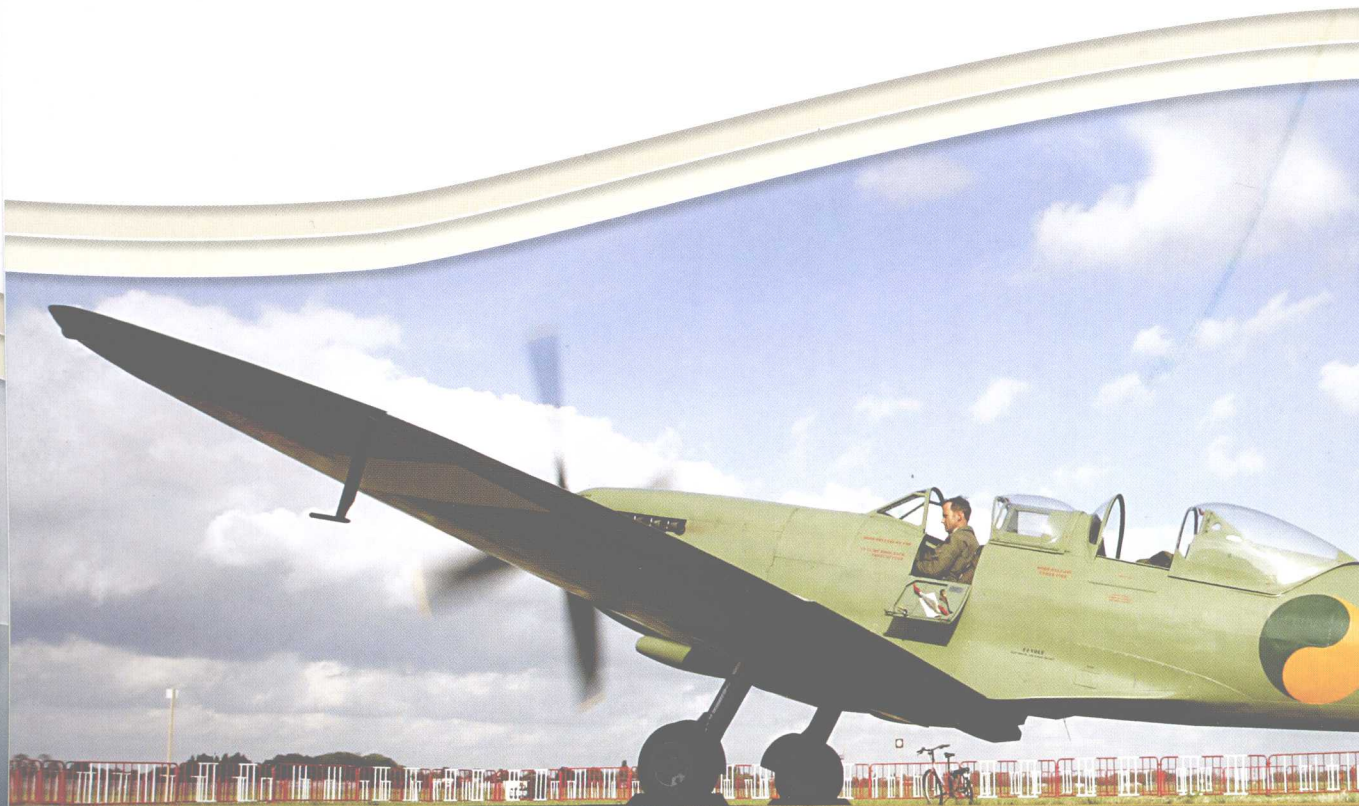


Make mine metal

使用金属

Aeroplane designers kept trying new ideas. In World War I, they started to think about using **metal**. Metal is a solid. It is hard, like wood. Unlike wood, metal does not burn easily. It does not break easily. It is strong. Most metals are also shiny. Metal can be made into different shapes.

飞机设计师不断尝试新的想法。在一战期间，他们开始考虑使用**金属**。金属是一种固体，像木头一样，很硬。但和木头不同，金属不易燃，也不容易折断，它的强度很高。大多数金属都有光泽。金属可以被加工成各种形状。



Aeroplane designers thought metal would be great for planes. They could make the metal into an aeroplane's shape. The metal would not catch fire. It would not break easily. Metal can be heavier than wood, but that was okay. Designers had built stronger engines.

Today, modern fighter jets have many metal parts. They also have parts made of other materials.

飞机设计师认为金属对飞机来说是很棒的选择。金属可以被加工成飞机的形状，金属又不容易着火，还不容易折断。金属比木头重，但也还好。设计师已经建造了功率更大的发动机。

当代战斗机有很多零部件是金属的，也还有用其他材料制成的零部件。

▼ The Supermarine Spitfire was flown during World War II (1939–1945). It looks different from the World War I fighter planes.

超级马林喷火式战斗机是在第二次世界大战时(1939–1945)服役的，它看起来完全不同于一战时的战斗机。

Metal matters

金属物质

There is more than one type of metal. Most metals have similar properties (features). Most metals are strong. Copper, lead, and gold are all metals.

金属可不止一种。大多数金属的性质相近——强度都很高。铜、铅、金都是金属。

Break it down

分解开来

A fighter jet is made of many parts. The **fuselage** is the main body of the jet. The tip of the fuselage is called the nose. The wings are attached to the fuselage. So are the tail and the engines. All these parts are made of **matter**.

Like the fighter jet, matter is made up of smaller parts. These smaller parts are called **atoms**. Atoms are so tiny that we cannot see them. Billions and billions of atoms join together. They form matter that we can see. The atoms have **properties** (features).

The atoms of different **metals** are different. Iron atoms are different from aluminium atoms. That is why different types of matter have different properties.

战斗机是由很多零部件组成的。**机身**是战斗机的主体部分。机身的前端称为机头。机翼和机身连在一起，机尾和发动机也连在一起。所有这些部件都是由**物质**构成的。

像战斗机一样，物质也是由小部件组成的。这些小部件称为**原子**。原子太小了，我们根本看不见。无数的原子聚集在一起，构成了我们能看见的物质。原子也有各种**性质**。

不同**金属**的原子是不同的。铁原子不同于铝原子。这就是为什么不同类型的物质有不同的性质。

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It takes billions and billions of atoms to make a fighter jet. Its parts are made of many different types of atom.

一架战斗机是由无数的原子构成的。它的不同部件是由很多种不同原子构成的。

weapons/missiles
武器/导弹

Try again!

不断尝试

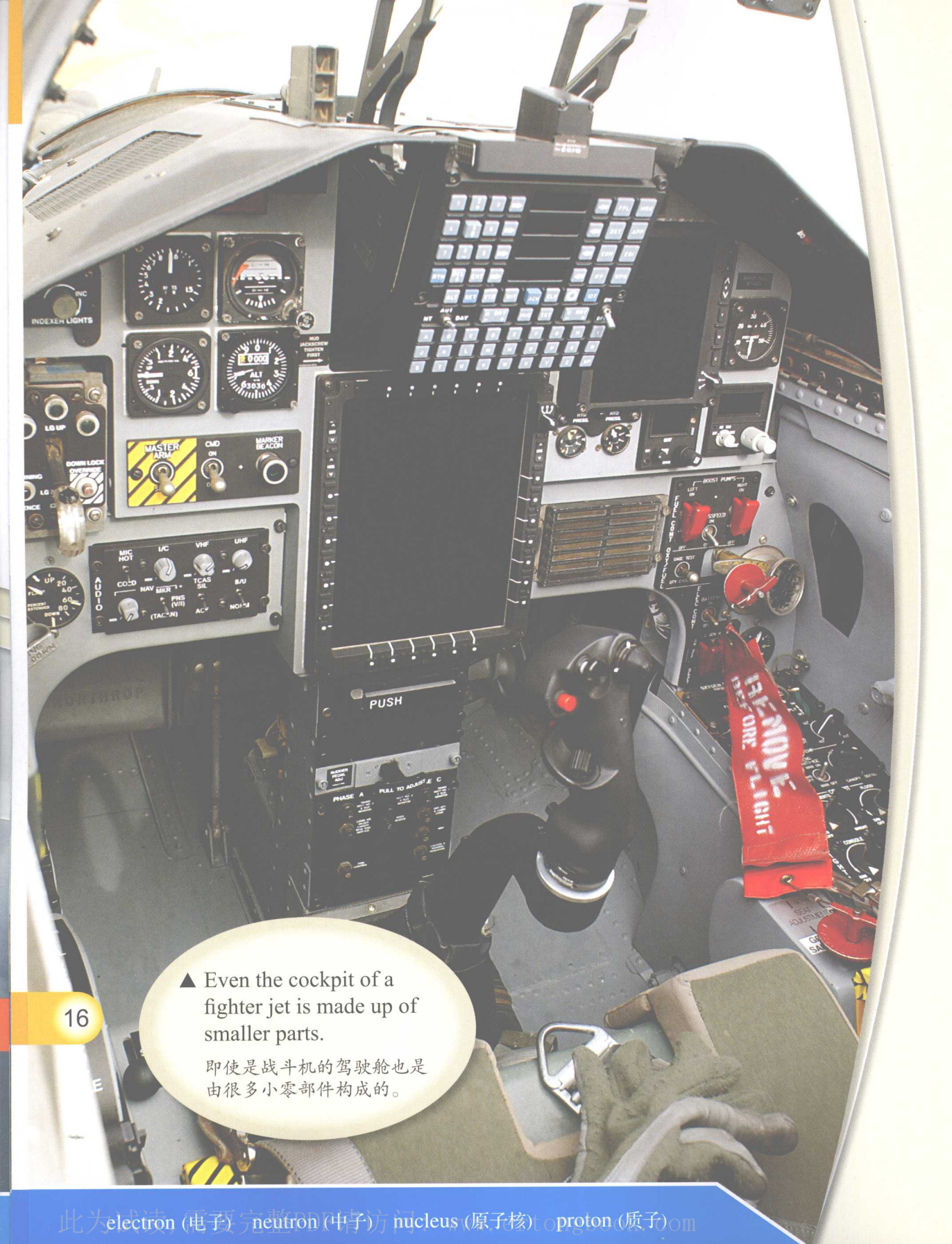
The F-15 fighter jet is always being improved. The very first one, the F-15A, was built in 1972. Better F-15 jets are now being flown.

F-15战斗机在不断改进。最早的一代，F-15A，建造于1972年。现在服役的是改进的F-15战斗机。

fuselage
机身

fuel tank
燃料箱

nose
机头



▲ Even the cockpit of a fighter jet is made up of smaller parts.

即使是战斗机的驾驶舱也是由很多小零部件构成的。