

科普英语注释读物

Rockets and Missiles

火箭与导弹

〔美〕 B. M. Parker 著

张家康 译注

商务印书馆

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Huǒjiàn Yu Dǎodǎn

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1. Rockets and Missiles

"... three, two, one, mainstage!"①

Another rocket blasts off toward space. It rises slowly from its launching pad and then picks up speed, breaking away with a deafening roar and leaving a trail of orange flame and smoke. Within seconds the rocket penetrates the upper atmosphere. It climbs upward and onward, with an artificial satellite cradled in its nose cone.②

Rockets have put dozens of satellites into orbit. In time, they will lift man himself into space. Rocket-powered spaceships will land man on the dusty plains of the moon. They may take him to distant planets. These ships may even soar into *interstellar space*, the domain of faraway stars.

It will be many, many years before rockets reach the stars. But they are already achieving goals that are as important to scientists as space travel itself. Rockets are serving as a productive research tool for meteorologists and physicists. They are answering many questions about the upper atmosphere and about phenomena in space. Rockets are also bringing about new developments in engineering and electronics.

Rockets are important, too, as thrust units for ballistic missiles. A missile has many advantages over a jet-powered bomber, with its human crew of pilots, bombardiers, and gunners. A missile rises from its launching site, then shrieks through and beyond the atmosphere at an unbelievable speed. Within minutes the coasting missile re-enters the atmosphere and strikes a target thousands of miles away. It can hit a target

with an atomic warhead.

Inside a big space-age rocket we find a complicated system of mechanical parts and electronic circuits. But, in principle, the rocket is simple. A big satellite rocket gets off the ground in the same way that an ordinary skyrocket shoots upward.③

New Words

rocket ['rɒkɪt] *n.* 火箭
missile ['mɪsaɪl; 'mɪsəl] *n.* 导弹,
 飞弹
mainstage ['meɪnstɛɪdʒ] *n.* 主
 级
blast [blɑːst] *v.t.*, *v.i.* 爆炸, 发
 出尖响
launch [lɔːntʃ] *v.t.* 发射
break [breɪk] *v.t.*, *v.i.* 打破, 断
 裂
deafen ['defn] *v.t.* 使聋, 使听不
 见
roar [rɔː] *n.* 呼啸声, 噪声
trail [treɪl] *n.* 尾迹
orange ['ɒrɪndʒ] *n.* 橙黄色
flame [fleɪm] *n.* 火焰
smoke [sməʊk] *n.* 烟雾
climb [klaɪm] *v.i.* 攀登, 爬高
artificial [ɑːtɪ'fɪʃəl] *a.* 人造的
satellite ['sætələɪt] *n.* 卫星
cradle [kreɪdl] *n.*; *v.t.* 摇篮, 把
 ...放在摇篮里
nose [naʊz] *n.* 鼻子; 前端
cone [kəʊn] *n.* 圆锥, 锥形体
dozen ['dʌzn] *n.* 一打(十二个)

orbit ['ɔːbɪt] *n.* 轨道
rocket-powered ['rɒkɪt'paʊəd]
 a. 装有火箭的, 以火箭为动力
 的
land [lænd] *n.*, *v.t.* 陆地, 使...登
 陆
dusty ['dʌstɪ] *a.* 土灰色的, 灰濛
 濛的
plain [pleɪn] *n.* 平原
soar [sɔː] *v.i.* 高飞
interstellar ['ɪntə'stelə] *a.* 星际的
domain [də'meɪn] *n.* 范围, 区
 域
goal [gəʊl] *n.* 目标, 目的
meteorologist [mɪ'tɜːrə'lɒdʒɪst]
 n. 气象工作者, 气象学家
thrust [θrʌst] *n.* 推力
unit ['juːnɪt] *n.* 单位
ballistic [bə'listɪk] *a.* 弹道的
jet-powered ['dʒet'paʊəd] *a.* 装
 有喷气发动机的
bomber ['bɒmə] *n.* 轰炸机
pilot ['paɪlət] *n.* 驾驶员
gunner ['ɡʌnə] *n.* 机枪手
site [saɪt] *n.* 场地, 场所

shriek [ʃri:k] *v.i.* 尖叫, 呼啸
 beyond [bi'jɒnd] *prep.* 在...外,
 超越...
 coast [kəʊst] *v.i.* 滑行
 re-enter ['ri:ˈentə] *v.t.* 再次进
 入, 重返
 strike [straɪk] *v.t.* 撞击, 击中
 target ['tɑ:ɡɪt] *n.* 靶子, 目标

hit [hit] *v.t.* 射击, 击中; 到达
 warhead ['wɔ:hed] *n.* 弹头, (导
 弹的) 战斗部
 mile [maɪl] *n.* 哩, 英里
 skyrocket ['skai'rɒkɪt] *n.* 花炮,
 焰火; 高空火箭
 shoot [ʃu:t] *v.i., v.t.* 发射, 放(花
 炮); 拍(照片)

Phrases and Expressions

blast off (火箭、导弹等) 点火起
 飞
 launching pad 发射架, 发射台
 pick up (使) 加速
 break away 脱离, 脱落

dozens of ... 许多, 大量的...
 in time 迟早, 总有一天
 space ship 宇宙飞船
 space-age rocket 宇宙航天火箭
 get off 离开

Notes

- ① ... three, two, one, mainstage!

引号内的句子表示发射火箭人员所说的话; 数词三、二、一等则为倒计数的秒数, 意即“三秒、二秒、一秒, 主级火箭发射!”

- ② It climbs upward and onward, with an artificial satellite cradled in its nose cone.

逗号后面的“with an ... cone”为一介词复合结构, with 后的名词与分词在逻辑上存在主谓关系。with 此时一般无词义, 不必译出。

- ③ ... in the same way that an ordinary skyrocket shoots upward:

句中 that 引出的是一限制性定语从句, 修饰主句中的名词 way, 关系代词 that 在从句中相等于“in which”, 与主句中的 the same 相呼应。

2. The Skyrocket

A cardboard tube serves as the body for the skyrocket, the kind① set off in Fourth of July celebrations. The fuel is gunpowder. The gunpowder is packed inside a cylindrical combustion chamber in the center of the tube.

Gunpowder is a mixture of charcoal, sulfur, and saltpeter (potassium nitrate). The saltpeter serves as an *oxidizer*, or *oxidizing agent*. An oxidizing agent contains oxygen. The oxygen makes it possible for the fuel to burn②. Many of the space-age rockets use oxygen itself as an oxidizer.

A fuse extends from the bottom end of the rocket, through the conical nozzle, and into the gunpowder. When lighted, the fuse burns quickly and ignites the gunpowder. As the gunpowder burns, gases accumulate in the combustion chamber. The expanding gases escape through the clay nozzle at the rear of the rocket.

The skyrocket shoots upward and forward in a reaction to the escaping gases. The force of the reaction is called *thrust*. Another name for thrust is *push*. The reaction to the escaping exhaust gases actually pushes the rocket off its launching pad. Thrust is measured in pounds. The *Atlas*, one of our big satellite launchers, has a take-off thrust of 360,000 pounds.

Every rocket carries a *payload*, or cargo. The payload of a skyrocket is made up of the chemicals that erupt into a brilliant display of "stars." The payload of a ballistic missile is its warhead. In a research rocket the payload consists of instruments and radio equipment. The space rocket carries a satellite

as a payload. The rockets that someday will put men into space will have human payloads.

Properly constructed, a skyrocket is harmless. But its fuel is a tricky mixture. Unless the ingredients are put together in just the right proportions, the gunpowder explodes when ignited. To burn without exploding, gunpowder must have an extra measure of charcoal. *It is not a safe fuel for a homemade rocket.*

New Words

cardboard ['kɑ:d'bɔ:d] *n.* 硬纸

板

tube ['tju:b] *n.* 管子

celebration [seli'breifən] *n.* 庆

祝会

gunpowder ['gʌnpaʊdə] *n.* 黑

色火药

pack [pæk] *v.t.* 包装; 装填

cylindrical [si'lindrikəl] *a.* 圆柱

形的

combustion [kəm'bʌstʃən] *n.* 燃

烧

chamber ['tʃeimbə] *n.* 舱室

mixture ['mikstʃə] *n.* 混合(物)

charcoal ['tʃɑ:kəʊl] *n.* 木炭, 焦

炭

sulfur ['sʌlfə] *n.* 硫磺

saltpeter ['sɔ:ltpi:tə] *n.* 钾硝, 硝

石

potassium [pə'tæsʃəm] *n.* 钾

nitrate ['naitreit] *n.* 硝酸

potassium ~ 火硝, 硝酸钾

oxidizer ['ɒksidaizə] *n.* 氧化剂,

氧化物

fuse [fju:z] *n.* 导火索(线头), 引

信

extend [iks'tend] *v.i.* 扩展; 延伸

bottom ['bɒtəm] *n.* 底(部)

~ end 底端

conical ['kɒnikl] *a.* 锥形的

nozzle ['nɒzl] *n.* 排气口; 喷嘴

ignite [ig'nait] *v.t.* 点燃, 点火

accumulate [ə'kju:mjuleit] *v.t.*

积聚, 聚集

expand [iks'pænd] *v.t., v.i.* 扩

张; 膨胀

escape [is'keip] *v.i., n.* 逃脱; 排

出, 逸出

clay [klei] *n., a.* 粘土; 陶土; 陶制

的

rear [riə] *a., n.* 后面的; 后面, 尾

部

exhaust [ig'zɔ:st] *n., v.t.* 排气,

排出

actually ['æktʃuəli] *ad.* 实际上
 launcher ['lɔ:ntʃə] *n.* 发射装置
 take-off ['teik əf] *n.* 起飞
 payload ['peiləʊd] *n.* 有效载物;
 有效载荷
 cargo ['kɑ:gəʊ] *n.* 载物;载重量
 chemical ['kemikəl] *a.* 化学的
 ~s *n.* 化学(物)品
 erupt [i'ɾʌpt] *v.i.* 喷出;迸发
 brilliant ['briljənt] *a.* 发光的,
 闪光的
 display [dis'plei] *n.* 演示,表现,
 显示
 research [ri'sə:tʃ] *n.,v.t.* 探索,

研究
 properly ['prɒpəli] *ad.* 合适地,
 适当地
 harmless ['hɑ:mlis] *a.* 无害的
 tricky ['triki] *a.* 微妙的,复杂的
 unless, [ən'les] *conj.* 若不,除非
 ingredient [in'ɡri:djənt] *n.* 配料;
 组成部分
 proportion [prə'pɔ:ʃən] *n.* 比例
 explode [iks'pləʊd] *v.i.,v.t.* 爆炸
 safe [seif] *a.* 安全的
 homemade ['həʊm'meid] *a.* 自
 制的;本国制的

Phrases and Expressions

set off 使...爆发,放(花炮等)
 oxidizing agent 氧化剂

in a reaction to ... 在...的反作
 用下

Notes

- (1) ..., the kind set off in fourth of July celebrations:
 句中“the kind”可理解为 the skyrockets of the kind 这一
 短语的简略形式。
- (2) The oxygen makes ... to burn.
 句中 it 为形式宾语,真正的宾语为不定式短语 for the fuel to
 burn, for the fuel 为不定式 to burn 的逻辑主语。

3. Why a Rocket Works

All the rockets ever assembled — the fireworks skyrocket, the ballistic missile, the big research rocket, the newest space rocket — have one thing in common. They all work because of a principle known as Newton's *Third Law of Motion*. Sir Isaac Newton (1642-1727), an English mathematician and philosopher, laid down the principle more than two hundred years ago.

Newton's third law of motion is simple enough. It states that *for every action there is an equal and opposite reaction, and the two are along the same straight line*.

The third law of motion is easy to demonstrate. Blow up a toy balloon; then release its nozzle and permit the air to escape. At the same time let the balloon fall freely from your hands. It flits helter-skelter about the room, but in the direction opposite to the flow of escaping gas (air). The balloon's forward motion, you see, is a reaction to the escaping jet of air. If a cardboard or paper cone-shaped nozzle is attached to the end of the balloon, the reaction force is greater than if just the rubber end of the balloon is used as the nozzle.

Perhaps you have heard someone say that a rocket moves forward because the escaping gas is pushing against air. This pushing-against-air explanation is wrong. The air behind a rocket, or, for that matter, the air behind the balloon, has nothing to do with the forward movement. In fact, a rocket actually works better in an airless environment (a vacuum) such as outer space than it does in the atmosphere①.

The air molecules making up the earth's atmosphere create

friction and tend to slow a rocket. In outer space a rocket moves with no air molecules to hold it back or to interfere with its exhaust②. Outer space is the ideal environment for rocket vehicles; in our atmosphere a rocket's efficiency is much lower than it is higher up in space.

You can demonstrate Newton's third law of motion with a garden hose. Stretch the hose along the ground and then turn on the water. As the water jets from the nozzle, the hose rises up, much like a snake. The hose coils back in a reaction to the escaping stream of water.

Another example of Newton's third law of motion has nothing to do with escaping gases or jet streams. But it relates to the same principle. Suppose you are in a canoe that is not anchored but is floating at a standstill in the middle of a lake. Toss a rock or any other heavy object backward from the rear of the canoe. As you hurl the rock, the canoe moves forward. It lurches from a standstill in a reaction to the movement of the outgoing rock.

Why do these reactions occur? It is perhaps easiest to understand the reaction in the case of the toy balloon. The air which is compressed within the balloon pushes from the inside with equal pressure in all directions as long as the nozzle is pinched between your fingers. When you open the nozzle, the air escapes, but in only one direction. The pressure within the balloon is no longer equal in all directions. As the compressed air rushes out of the nozzle, the unreleased pressure inside the balloon is greater than the pressure at the opening. The unreleased pressure on the wall of the balloon opposite the opening pushes the balloon forward.

New Words

assemble [ə'sembl] *v.t.* 装配, 制

作

firework ['faɪəwɜ:k] *n.* 焰火, 花

炮

mathematician [məθimə'tɪʃən]

n. 数学工作者, 数学家

philosopher [fɪ'lɒsəfə] *n.* 哲学工

作者, 哲学家

lay [lei] (laid [leid]) *v.t.* 放; 拟

订

state [steɪt] *n.* 国家; 状态 *v.t.* 叙

述

demonstrate ['demonstreɪt] *v.t.*

证明, 说明

blow [bləʊ] *v.t.* 吹(风); 打击

toy [tɔɪ] *n.* 玩具

balloon [bə'lʊ:n] *n.* 气球

release [ri'li:s] *v.t., n.* 放松, 松

开

permit [pə'mɪt] *v.t.* 允许, 让

fall [fɔ:l] (fell [fel], fallen ['fɔ:l-

lən]) *v.i.* 掉落, 落下

flit [flɪt] *v.t.* 飞掠, 掠过

helter-skelter ['heltə-'skeltə] *ad.*

慌慌张张地

flow [fləʊ] *v.i., n.* 流动; 流

cone-shaped ['kəʊn-'ʃeɪpt] *a.* 圆

锥形的

attach [ə'tæʃ] *v.t.* 附加, 装上

rubber ['rʌbə] *n., a.* 橡皮(的)

perhaps [pə'hæps] *ad.* 也许, 大

概

explanation [eksplə'neɪʃən] *n.* 解

释, 说明

wrong [rɒŋ] *n., a., ad.* 错误(的

[地])

behind [bi'haind] *prep.* 在...后

面

environment [ɪn'vaɪərənmənt]

n. 环境

vacuum ['vækjuəm] *n.* 真空

create [kri:'eɪt] *v.t.* 创立, 创造;

产生

friction ['frikʃən] *n.* 摩擦(力)

tend [tend] *v.i.* 倾向于

hold [həʊld] *v.t.* 持; 拿; 握

interfere [ɪntə'fɪə] *v.t., v.i.* 干扰,

妨碍

ideal [ai'diəl] *a.* 理想的

vehicle ['vi:ɪkl] *n.* 车辆; 运载器

efficiency [ɪ'fɪʃənsi] *n.* 效能, 效

率

hose [haʊz] *n.* 胶皮(软)管

stretch [stretʃ] *v.t.* 拉长, 伸展

turn [tɜ:n] *v.t., v.i.* 转变, 转向

snake [sneɪk] *n.* 蛇

coil [kɔɪl] *v.i.* 河流、管子等盘

绕

relate [re'leɪt] *v.t., v.i.* 联系; 与

...有关

canoe [kə'nu:] *n.* 独木舟, 小船

anchor ['æŋkə] *n., v.t.* 锚; 用锚

绳系住

float [fləʊt] *v.i.* 漂泊; 浮动

standstill ['stænd'stil] *n.* 停顿,

停止不动

lake [leɪk] *n.* 湖

toss [tɒs] *v.t.* 向上扔[抛]

rock [rɒk] *n.* 岩石; 石块

hurl [hɜ:l] *v.t.* 猛投, 猛扔

backward ['bækwəd] *a., ad.* 落

后的, 向后

lurch [lɜ:tʃ] *v.i.* 动荡; 晃动

occur [ə'kə:] *v.i.* 出现; 发生

compress [kəm'pres] *v.t.* 压缩

pinch ['pɪntʃ] *v.t.* 挟住

finger ['fɪŋgə] *n.* 手指(头)

opening ['əʊpnɪŋ] *n.* 开口; 出

(气)口

Phrases and Expressions

because of... 由于..., 因为...

(to) be known as ... 被称为...

lay down 制定, 拟定; 主张

blow up ... 吹胀...; 把...吹鼓起

来

flit about 飞来飞去

for that matter 就这方面来说

have nothing to do with... 与

...毫无关系

hold (something) back 使(某

物)退缩; 阻止...前进

interfere with ... 干扰, 妨碍

turn on 接通, 拧开(水源、电源

或开关等)

turn off 关闭, 切断(水源、电源

或开关等)

relate to ... 使与...有关, 有联系

in all directions 朝四面八方, 朝

各个方向

no longer 不再

Notes

① In fact ... than it does in the atmosphere.

than 连接的是比较从句, 从句中的 it does = a rocket works.

② ... with no air molecules to hold it back or to interfere with its exhaust:

句中 with no air molecules = without any air molecules, 其后的不定式短语 to hold it back 及 to interfere with its exhaust 说明前面的名词 air, 作它的后置定语, 也可以把 with ... exhaust 看成一种作状语用的复合结构。

4. A Reaction Engine

When a rocket is fired, hot gases spew from its exhaust nozzle. The reaction to this escape of gases, which are exerting very great pressure inside the combustion chamber, propels the rocket forward, just as the reaction to the escaping air moves the toy balloon forward. A rocket is a *reaction engine*.

A basic rocket engine has no moving parts. Yet it is a mistake to look upon the modern space-age rocket as altogether simple. A modern liquid rocket is an ingenious mechanism of turbines, pumps, valves, fuel systems, and electronic controls.

Technically, the term “rocket,” or thrust unit, applies only to the engine and the propellant tanks of a missile or space rocket — not to the total vehicle. The intricate *controls* and the *guidance system* have little to do with the force needed for getting a rocket off the ground. They are like power steering and the human driver in automobiles. The engine runs without them once it is turned on. But they add much to the vehicle's performance and safety.

New Words

fire [faɪə] *v.t.* 把...点燃, 发射
(火箭等)

spew [spju:] *v.t., v.i.* 涌出, 喷出

exert [ɪg'zɜ:t] *v.t.* 施加(压力
等); 发挥影响

propel [prə'pel] *v.t.* 推进

basic ['beɪsɪk] *a.* 基本的; 主要

的

mistake [mɪs'teɪk] *v.t., n.* 弄错;
错误; 误差

ingenious [ɪn'dʒɪnjəs] *a.* 灵巧
的, 精巧的

mechanism ['mekənɪzəm] *n.* 机构;
机械装置

valve ['vælv] *n.* 阀门
technically ['teknikəli] *ad.* 从技术上说,在技术方面
propellant [prə'pelənt] *n.* 推进剂,喷气燃料
~ tank 喷气燃料箱

intricate ['intrikit] *a.* 复杂的
guidance ['gaidəns] *n.* 引导;制导;导航
steering ['stiəriŋ] *n.* 驾驶;操纵;转向
add [æd] *v.t.* 增添

Phrases and Expressions

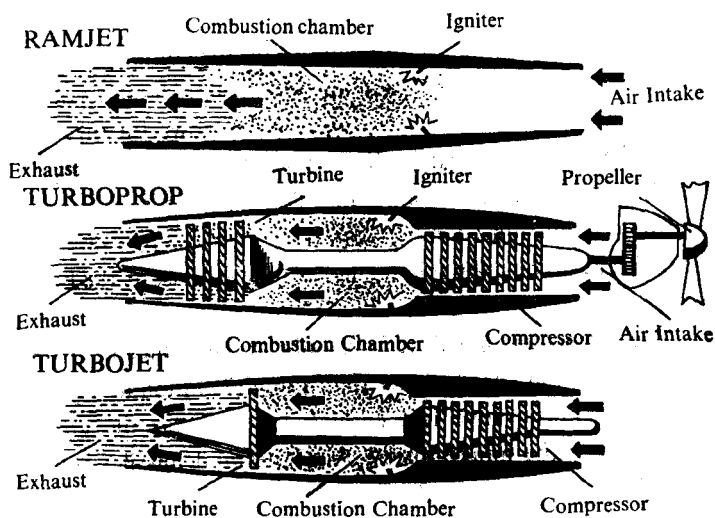
look upon ... as ... 把...看成是...

have little to do with ... 与...没多大(几乎没有)关系

5. Jet Propulsion

Another kind of engine is also a reaction engine. It is the *jet engine*. Some airplanes and missiles use jet engines. It is important to remember that jet-powered missiles are not rockets①. They behave much like rockets, but such missiles never leave the atmosphere. They cannot function in airless space.

Both the jet engine and the rocket engine work as a result of *jet propulsion*. That is, they both react to the force of an escaping jet (a jet of gas). But there is an important difference between the two. The jet engine gets its oxygen from the outside air. The rocket engine carries its own oxygen.



There are three main types of jet engines: (1) the ramjet,

(2) the turbojet, and (3) the turboprop.

The *ramjet* engine has no moving parts. It is so simple that it is sometimes referred to as a "flying stovepipe." Another name for the ramjet is *athodyd*. This name comes from the term "aero thermodynamic duct."

To keep the engine running, the airplane or missile *rams* through the atmosphere at a high speed. Air pours into the engine through a specially designed intake duct at the front. The shape of the duct causes the air to be compressed.

The compressed air builds up a tremendous pressure. It squeezes into a combustion chamber. In the combustion chamber the compressed air mixes with a liquid fuel such as kerosene. An electric spark ignites the mixture. *Flame holders* keep a flame going constantly. The holders prevent the swiftly moving air from putting out the fire.

As the fuel burns, gases expand to fill the combustion chamber at a high pressure. The compressed gases escape through the exhaust nozzle at the rear, providing a powerful thrust that drives the missile forward. The exhaust, you see, works like the air escaping from a balloon. The unreleased pressure inside the combustion chamber is greater than the pressure at the nozzle itself. Thus, the missile moves forward just as the balloon did.

The ramjet engine functions only at high speed. In fact, it operates best at speeds faster than sound (750 mph at sea-level). The engine must move fast enough to compress the air as it flows through the intake duct. Airplanes and missiles powered by ramjet engines use booster rockets to get them off the ground. The rockets give the planes and missiles enough speed to make the ramjet engine workable.