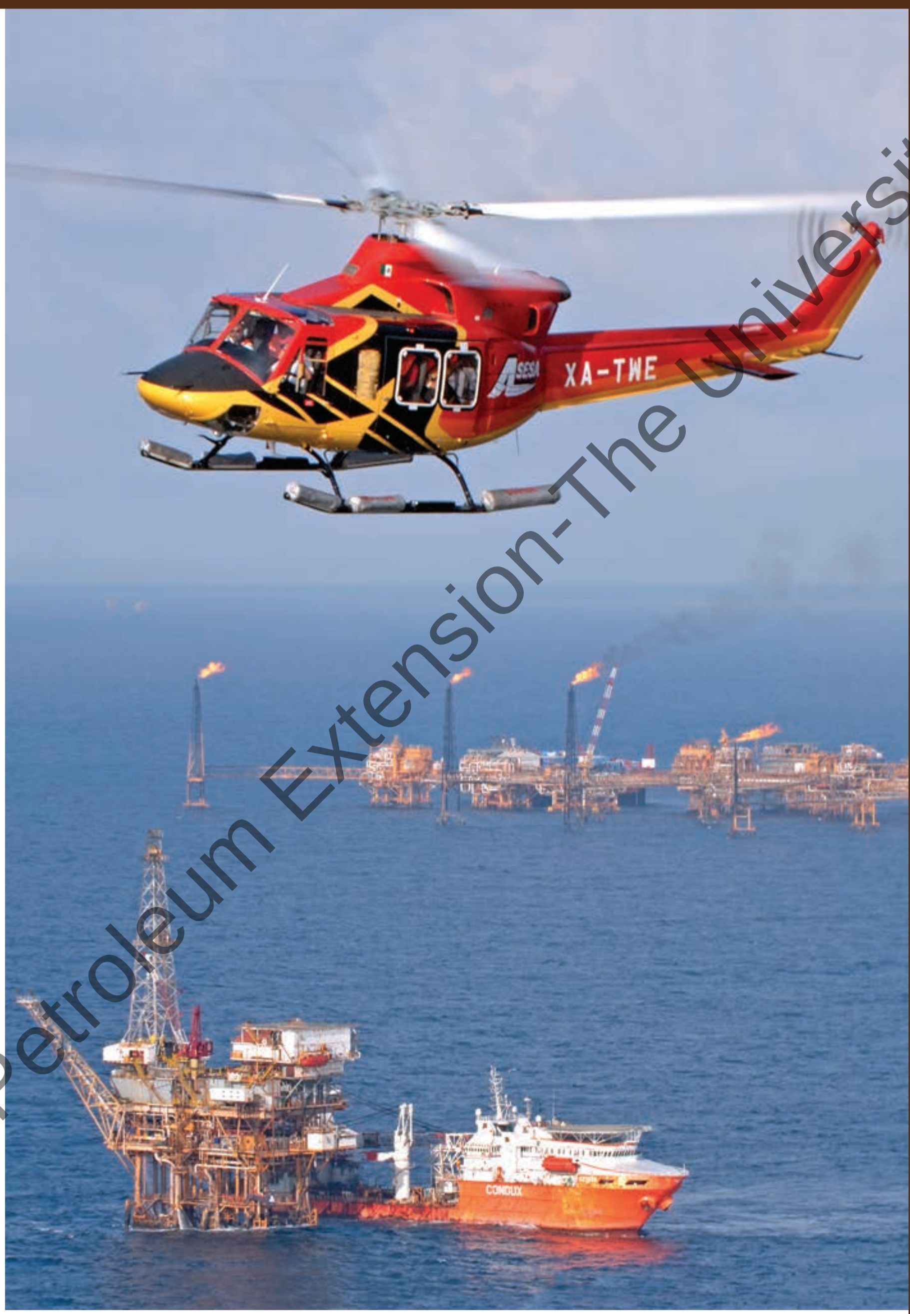
ROTARY DRILLING

HELICOPTER SAFETY



First Edition

UNIT V • LESSON 7

ROTARY DRILLING SERIES

Unit I: The Rig and Its Maintenance

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Lesson 2: The Bit
Lesson 3: Drill String and Drill Collars
Lesson 4: Rotary, Kelly, Swivel, Tongs, and Top Drive
Lesson 5: The Blocks and Drilling Line
Lesson 6: The Drawworks and the Compound
Lesson 7: Drilling Fluids, Mud Pumps, and Conditioning Equipment
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Units of Measurement

Throughout the world, two systems of measurement dominate: the English system and the metric system. Today, the United States is one of only a few countries that employs the English system.

The English system uses the pound as the unit of weight, the foot as the unit of length, and the gallon as the unit of capacity. In the English system, for example, 1 foot equals 12 inches, 1 yard equals 36 inches, and 1 mile equals 5,280 feet or 1,760 yards.

The metric system uses the gram as the unit of weight, the metre as the unit of length, and the litre as the unit of capacity. In the metric system, 1 metre equals 10 decimetres, 100 centimetres, or 1,000 millimetres. A kilometre equals 1,000 metres. The metric system, unlike the English system, uses a base of 10; thus, it is easy to convert from one unit to another. To convert from one unit to another in the English system, you must memorize or look up the values.

In the late 1970s, the Eleventh General Conference on Weights and Measures described and adopted the Système International (SI) d'Unités. Conference participants based the SI system on the metric system and designed it as an international standard of measurement.

The *Rotary Drilling Series* gives both English and SI units. And because the SI system employs the British spelling of many of the terms, the book follows those spelling rules as well. The unit of length, for example, is *metre*, not *meter*. (Note, however, that the unit of weight is *gram*, not *gramme*.)

To aid U.S. readers in making and understanding the conversion to the SI system, we include the following table.

English-Units-to-SI-Units Conversion Factors

Quantity or Property	English Units	Multiply English Units By	To Obtain These SI Units
Length, depth, or height	inches (in.)	25.4	millimetres (mm)
		2.54	centimetres (cm)
	feet (ft)	0.3048	metres (m)
	yards (yd)	0.9144	metres (m)
	miles (mi)	1609.344	metres (m)
		1.61	kilometres (km)
Hole and pipe diameters, bit size	inches (in.)	25.4	millimetres (mm)
Drilling rate	feet per hour (ft/h)	0.3048	metres per hour (m/h)
Weight on bit	pounds (lb)	0.445	decanewtons (dN)
Nozzle size	32nds of an inch	0.8	millimetres (mm)
Volume	barrels (bbl)	0.159	cubic metres (m^3)
		159	litres (L)
	gallons per stroke (gal/stroke)	0.00379	cubic metres per stroke (m^3/stroke)
	ounces (oz)	29.57	millilitres (mL)
	cubic inches ($in.^3$)	16.387	cubic centimetres (cm^3)
	cubic feet (ft^3)	28.3169	litres (L)
		0.0283	cubic metres (m^3)
	quarts (qt)	0.9464	litres (L)
	gallons (gal)	3.7854	litres (L)
	gallons (gal)	0.00379	cubic metres (m^3)
	pounds per barrel (lb/bbl)	2.895	kilograms per cubic metre (kg/m^3)
	barrels per ton (bbl/tn)	0.175	cubic metres per tonne (m^3/t)
Pump output and flow rate	gallons per minute (gpm)	0.00379	cubic metres per minute (m^3/min)
	gallons per hour (gph)	0.00379	cubic metres per hour (m^3/h)
	barrels per stroke (bbl/stroke)	0.159	cubic metres per stroke (m^3/stroke)
	barrels per minute (bbl/min)	0.159	cubic metres per minute (m^3/min)
Pressure	pounds per square inch (psi)	6.895	kilopascals (kPa)
		0.006895	megapascals (MPa)
Temperature	degrees Fahrenheit (°F)	$\frac{°F - 32}{1.8}$	degrees Celsius (°C)
Thermal gradient	1°F per 60 feet	—	1°C per 33 metres
Mass (weight)	ounces (oz)	28.35	grams (g)
	pounds (lb)	453.59	grams (g)
		0.4536	kilograms (kg)
	tons (tn)	0.9072	tonnes (t)
	pounds per foot (lb/ft)	1.488	kilograms per metre (kg/m)
Mud weight	pounds per gallon (ppg)	119.82	kilograms per cubic metre (kg/m^3)
	pounds per cubic foot (lb/ft^3)	16.0	kilograms per cubic metre (kg/m^3)
Pressure gradient	pounds per square inch per foot (psi/ft)	22.621	kilopascals per metre (kPa/m)
Funnel viscosity	seconds per quart (s/qt)	1.057	seconds per litre (s/L)
Yield point	pounds per 100 square feet (lb/100 ft^2)	0.48	pascals (Pa)
Gel strength	pounds per 100 square feet (lb/100 ft^2)	0.48	pascals (Pa)
Filter cake thickness	32nds of an inch	0.8	millimetres (mm)
Power	horsepower (hp)	0.75	kilowatts (kW)
Area	square inches ($in.^2$)	6.45	square centimetres (cm^2)
	square feet (ft^2)	0.0929	square metres (m^2)
	square yards (yd^2)	0.8361	square metres (m^2)
	square miles (mi^2)	2.59	square kilometres (km^2)
	acre (ac)	0.40	hectare (ha)
Drilling line wear	ton-miles (tn•mi)	14.317	megajoules (MJ)
		1.459	tonne-kilometres (t•km)
Torque	foot-pounds (ft•lb)	1.3558	newton metres (N•m)

Development of Commercial Helicopters

The first successful helicopter designer was Igor Sikorsky, a Russian who immigrated to America and in 1923 founded his own aviation design company. In 1931, Sikorsky patented the standard design for a helicopter: a main rotor overhead and a smaller rotor on the tail to keep the helicopter stable and upright. The Sikorsky XR-4 was the first helicopter in the world to enter into continuous production. In 1942, the Sikorsky helicopter was delivered to the U.S. Army Air Force for use in World War II (fig. 1). The helicopter proved its usefulness in combat. It could hover, rise and descend vertically, fly sideways and backwards.

Figure 1. Dr. Igor Sikorsky (left) and Orville Wright (right) with the Sikorsky XR-4 in 1942—U.S. Air Force, Wright Patterson Air Force Base

Safety Features of Helicopter Transportation

Helicopter operators, offshore drilling contractors, and oil operators use strict safety procedures and features to protect crew transfers and equipment between the shore and offshore structures (fig. 6). All workers are fully trained and must be aware of the importance of safety in and around the helicopters.

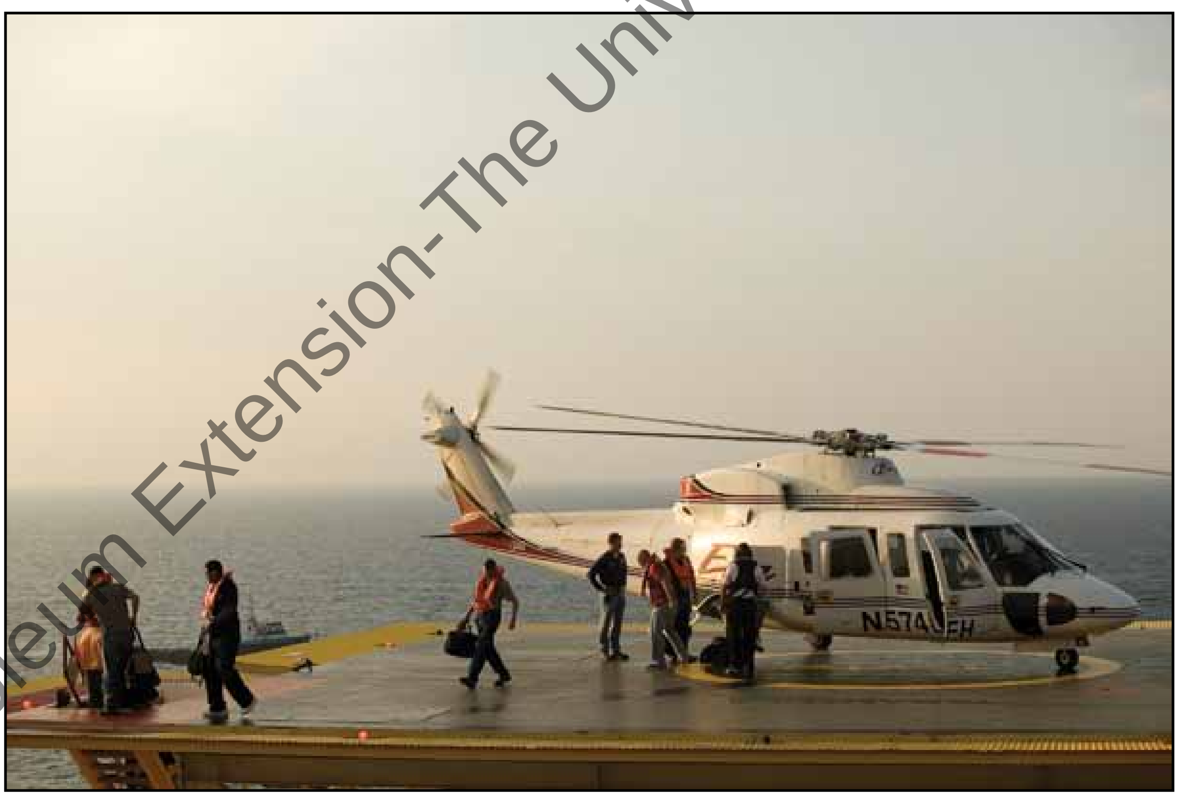

Figure 6. Helicopter arriving at an offshore platform (Courtesy of Apache Corporation)

The Normal Flight

Safety Regulations

A key to offshore transportation's successful safety record is the extreme caution exercised by the helicopter operating company and its customers—the offshore drilling contractors and oil producers whose crews and equipment are served by the helicopters. The petroleum industry's safety regulations for offshore helicopter operations are stricter than those set by the Federal Aviation Administration. The FAA rules for commercial aircraft are more general and broader because they are designed to cover a wide spectrum of aircraft and functions.

Only slight variations in instructions and flight procedures exist among all the helicopter transportation companies and their customers. Modifications in instructions and procedures are designed to fulfill the company's specific safety regulations and provide what each company believes to be the best in safety procedures.

For example, some companies require that, wherever possible, the helicopter's engine be shut down and the rotors stopped before any person approaches, leaves the craft, or while loading or unloading any cargo. However, another company may require only that personnel leaving or approaching a helicopter use caution and crouch forward while in the area of the moving rotor blades. The safest way for a passenger to embark (fig. 18) or disembark from a helicopter is explained in the preboarding passenger briefing videos and also written up in the safety features cards on board the helicopter.

The Aborted Flight

In a routine helicopter flight everything generally goes smoothly. This chapter explains what happens if helicopter problems cause a *ditching* or an emergency landing on water. It will cover in general terms what may happen, what the pilot may do, or ask passengers to do, after hitting the water.

When a helicopter is ditched, passengers should always follow the pilot's instructions because every situation is different.

Ditching at Sea

The ditching experience is not always a total catastrophe. Panicked passengers will definitely not help the situation. The pilots are trained to handle emergency situations and will do their utmost to make sure everyone is safe. To renew their licenses, pilots must periodically demonstrate that they know what to do if a flight *aborts*, or ends, in a ditching. In addition, pilots receive regular safety updates about new or improved equipment or procedures.

The Federal Aviation Administration requires all commercial aircraft that fly passengers over water to carry sufficient life vests, life rafts, and other emergency supplies. Pilots are expected to explain to passengers in simple, clear language how safety equipment is used, where it is stored, and how to safely leave a now-floating aircraft. Because offshore passengers and pilots are required to wear life vests and/or immersion suits before takeoff, this added precaution saves precious time in a ditching situation (fig. 27).

The pilot will radio the helicopter's position and condition to the radio communication base *dispatcher* and land the craft as quickly and as gently as possible using autorotation. The dispatcher can quickly alert the emergency rescue authorities, such as the U.S.Coast Guard, about a *mayday* message (fig. 28).

Safety on the Offshore Helideck

Offshore helidecks, heliports, or helipads are designed to provide maximum efficiency and safety for the type and number of helicopters using the facility. The American National Standards Institute states that a *heliport* is similar to an airport because it has runways, taxiways, and an *apron* or the area designated for loading and unloading passengers and cargo. A *helipad* is the touchdown and liftoff point of the heliport or can be a stand-alone area of operation. A *helideck* is the most commonly used term for the landing site on an offshore drilling rig or platform (fig. 45). In the North Sea, some offshore standards refer to a helideck for offshore rigs and heliport for drillships.

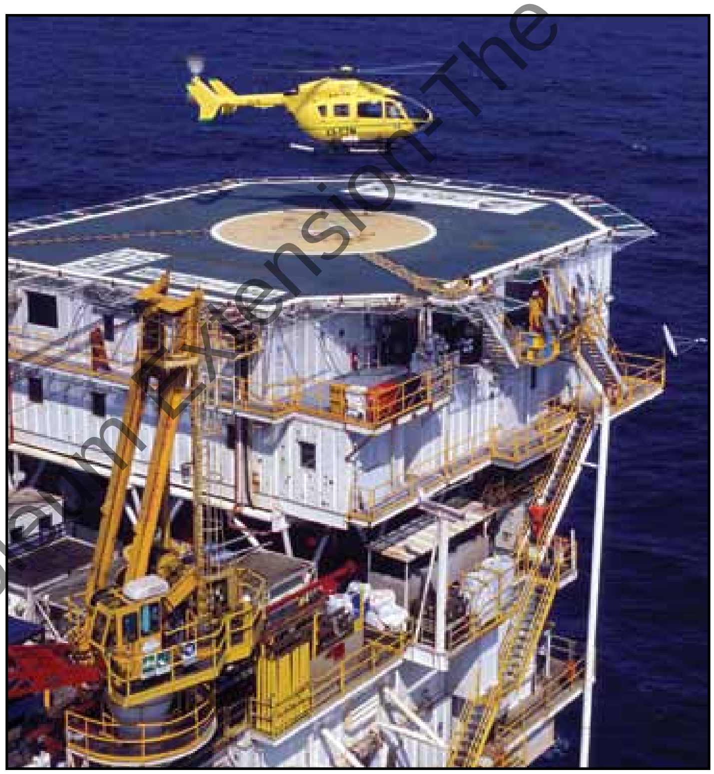

Figure 45. The helicopter landing area on a helideck—offshore Mexico. (Photo by Jérome Deulin, Eurocopter)

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