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chapter 8

Page 380

Reporting and Interpreting Property, Plant, and Equipment; Intangibles; and Natural Resources

As of December 31, 2011, Southwest Airlines operated 610 Boeing 737 aircraft and 88 Boeing 717 aircraft, providing service to 73 domestic cities in 38 states, and was the largest U.S. air carrier in number of originating passengers boarded and number of scheduled domestic departures. Southwest is a capital-intensive company with more than \$12 billion in property, plant, and equipment reported on its balance sheet. In fiscal year 2011, Southwest spent \$968 million on aircraft and other flight equipment as well as ground equipment. Since the demand for air travel is seasonal, with peak demand occurring during the summer months, planning for optimal productive capacity in the airline industry is very difficult. Southwest's managers must determine how many aircraft are needed in which cities at what points in time to fill all seats demanded. Otherwise, the company loses revenue (not enough seats) or incurs higher costs (too many seats).

Learning Objectives

After studying this chapter, you should be able to:

- 8-1** Define, classify, and explain the nature of long-lived productive assets and interpret the fixed asset turnover ratio. p. 383
- 8-2** Apply the cost principle to measure the acquisition and maintenance of property, plant, and equipment. p. 384
- 8-3** Apply various cost allocation methods as assets are held and used over time. p. 390

- 8-4** Explain the effect of asset impairment on the financial statements. p. 401
- 8-5** Analyze the disposal of property, plant, and equipment. p. 402
- 8-6** Apply measurement and reporting concepts for intangible assets and natural resources. p. 404
- 8-7** Explain how the acquisition, use, and disposal of long-lived assets impact cash flows. p. 410

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Page 381



Demand is also highly sensitive to general economic conditions and other events beyond the control of the company. Even the best corporate planners could not have predicted the September 11, 2001, terrorist attacks against the United States that rocked the airline industry. The war in Iraq led to further declines in the demand for air travel. In response to the precipitous drop in demand, many airlines accelerated retirement of various aircraft, temporarily grounded aircraft, and considered delaying the purchase of new aircraft. Then, a worsening global economic environment provided more challenges for the airline industry. With fuel prices more than tripling between 2000 and 2011, many carriers were forced to reduce capacity.

FOCUS COMPANY:

Southwest Airlines

MANAGING PRODUCTIVE
CAPACITY FOR THE LOW-FARE

www.southwest.com

UNDERSTANDING THE BUSINESS

One of the major challenges managers of most businesses face is forecasting the company's long-term productive capacity—that is, predicting the amount of plant and equipment it will need. If managers underestimate the need, the company will not be able to produce enough goods or services to meet demand and will miss an opportunity to earn revenue. On the other hand, if they overestimate the need, the company will incur excessive costs that will reduce its profitability.

The airline industry provides an outstanding example of the difficulty of planning for and analyzing productive capacity. If an airplane takes off from Kansas City, Missouri, en route to New York City with empty seats, the economic value associated with those seats is lost for that flight. There is obviously no way to sell the seat to a customer after the airplane has left the gate. Unlike a manufacturer, an airline cannot “inventory” seats for the future.

Likewise, if an unexpectedly large number of people want to board a flight, the airline must turn away some customers. You might be willing to buy a television set from Sears even if you had to wait one week for delivery, but you probably wouldn't book a flight home on Thanksgiving weekend on an airline that told you no seats were available. You would simply pick another airline or use a different mode of transportation.

Southwest has a number of large competitors with familiar names such as American, United Continental, JetBlue, and Delta. Southwest's 10-K report

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mentions that the company “currently competes with other airlines on almost all of its routes ... Some of these airlines have larger fleets than Southwest and some may have wider name recognition in certain markets.”

Page 382

Much of the battle for passengers in the airline industry is fought in terms of property, plant, and equipment. Passengers want convenient schedules (which requires a large number of aircraft), and they want to fly on new, modern airplanes. Because airlines have such a large investment in equipment but no opportunity to inventory unused seats, they work very hard to fill their aircraft to capacity for each flight. Southwest's Annual Report for 2011 describes the keys to its ability to offer low fares and generous frequent flyer benefits.



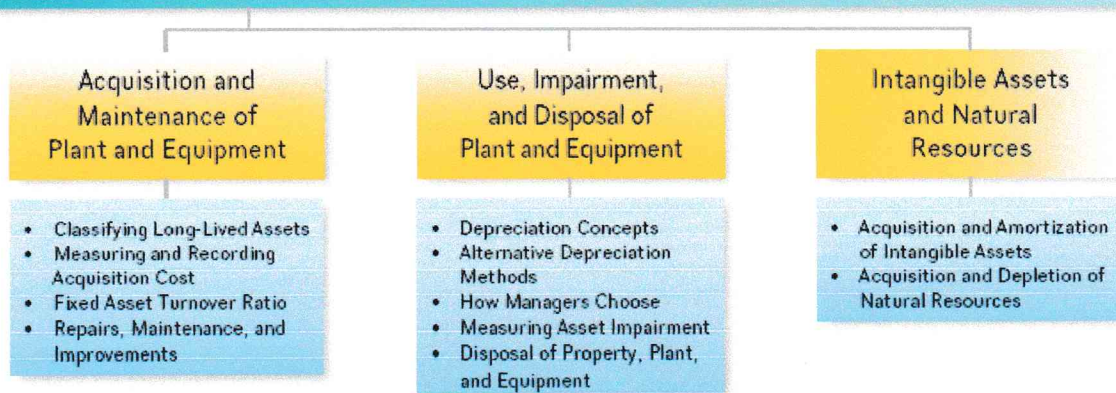
REAL WORLD EXCERPT
Annual Report

A key component of the Company's business strategy has been its low-cost structure, which was designed to allow it to profitably charge low Southwest fares. Adjusted for stage length, Southwest and AirTran have lower unit costs, on average, than most major carriers. The Company's low-cost structure has historically been facilitated by Southwest's use of a single aircraft type, the Boeing 737, an operationally efficient point-to-point route structure, and highly productive Employees.

As you can see from this discussion, issues surrounding property, plant, and equipment have a pervasive impact on a company in terms of strategy, pricing decisions, and profitability. Managers devote considerable time to planning optimal levels of productive capacity, and financial analysts closely review a company's statements to determine the impact of management's decisions.

This chapter is organized according to the life cycle of long-lived assets—acquisition, use, and disposal. First we will discuss the measuring and reporting issues related to land, buildings, and equipment. Then we will discuss the measurement and reporting issues for intangible assets and natural resources. Among the issues we will discuss are the maintenance, use, and disposal of property and equipment over time and the measurement and reporting of assets considered impaired in their ability to generate future cash flows.

ORGANIZATION of the Chapter



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ACQUISITION AND MAINTENANCE OF PLANT AND EQUIPMENT

Page 383

LEARNING OBJECTIVE 8-1

Define, classify, and explain the nature of long-lived productive assets and interpret the fixed asset turnover ratio.

Exhibit 8.1 shows the asset section of the balance sheet from Southwest's annual report for the fiscal year ended December 31, 2011. Over 67 percent of Southwest's total assets are flight and ground equipment. Southwest also reports other assets with probable long-term benefits. Let's begin by classifying these assets.

Classifying Long-Lived Assets

LONG-LIVED ASSETS are tangible and intangible resources owned by a business and used in its operations over several years.

The resources that determine a company's productive capacity are often called **long-lived assets**. These assets, which are listed as noncurrent assets on the balance sheet, may be either tangible or intangible and have the following characteristics:

TANGIBLE ASSETS have physical substance.

1. **Tangible assets** have physical substance; that is, they can be touched. The three kinds of long-lived tangible assets are:
 - a. **Land** used in operations. As is the case with Southwest, land often is not shown as a separate item on the balance sheet.
 - b. **Buildings, fixtures, and equipment** used in operations. For Southwest, this category includes aircraft, ground equipment to service the aircraft, and office space. (*Note:* Land, buildings, fixtures, and equipment are also called **property, plant, and equipment** or **fixed assets**.)
 - c. **Natural resources** used in operations. Southwest does not report any natural resources on its balance sheet. However, companies in other industries report natural resources such as timber tracts and silver mines.

INTANGIBLE ASSETS have special rights but not physical substance.

2. **Intangible assets** are long-lived assets without physical substance that confer specific rights on their owner. Examples are patents, copyrights, franchises, licenses, and trademarks. Southwest reports \$970 million of goodwill on its balance sheet.

Measuring and Recording Acquisition Cost

Plant and Equipment as a Percent of Total Assets for Selected Focus Companies

National Beverage 30.3%



Chipotle Mexican Grill 55.8%



Harley-Davidson 8.4%



Under the cost principle, all reasonable and necessary expenditures made in acquiring and preparing an asset for use (or sale, as in the case of inventory) should be recorded as the cost of the asset. We say that the expenditures are **capitalized** when they are recorded as part of the cost of an asset instead of as expenses in the current period. Any sales taxes, legal fees, transportation costs, and installation costs are then added to the purchase price of the asset. However, special discounts are subtracted and any interest charges associated with the purchase are expensed as incurred.

SOUTHWEST AIRLINES CO.		
Consolidated Balance Sheets (partial)		
December 31, 2011 and 2010		
<i>Assets (dollars in millions)</i>	2011	2010
Current assets: (summarized)	\$ 4,345	\$ 4,279
Property and equipment, at cost:		
Flight equipment	15,542	13,991
Ground property and equipment	2,423	2,122
Deposits on flight equipment purchase contracts	456	230
	18,421	16,343
Less allowance for depreciation and amortization	6,294	5,765
Total property and equipment	12,127	10,578
Goodwill	970	—
Other assets	626	606
Total assets	\$18,068	\$15,463

EXHIBIT 8.1

Southwest Airlines's Asset Section of the Balance Sheet



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KEY RATIO ANALYSIS



Fixed Asset Turnover

Page 384

? ANALYTICAL QUESTION

How effectively is management utilizing fixed assets to generate revenues?

% RATIO AND COMPARISONS

$$\text{Fixed Asset Turnover} = \frac{\text{Net Sales (or Operating Revenues)}}{\text{Average Net Fixed Assets}^*}$$

The 2011 ratio for Southwest is (dollars in millions):

$$\text{Operating Revenues } \$15,658 \div [(\$10,578 + \$12,127) \div 2] = 1.38 \text{ times}$$

COMPARISONS OVER TIME Southwest Airlines			COMPARISONS WITH COMPETITORS Delta United Continental Holdings	
2009	2010	2011	2011	2011
0.96	1.14	1.38	1.73	2.96

💡 INTERPRETATIONS

In General The fixed asset turnover ratio measures the sales dollars generated by each dollar of fixed assets used. A high rate normally suggests effective management. An increasing rate over time signals more efficient fixed asset use. Creditors and security analysts use this ratio to assess a company's effectiveness in generating sales from its fixed assets.

Focus Company Analysis Southwest's fixed asset turnover ratio increased between 2009 and 2011. Although at first glance it appears that Southwest is less efficient than perennial money losers Delta and United Continental Holdings, this is not the case. Their higher fixed asset turnover is due to the greater age of their fleet (a higher percentage has been depreciated) and the fact that more planes are leased in such a way that they do not appear as fixed assets on the balance sheet.

A Few Cautions A lower or declining fixed asset turnover rate may indicate that a company is expanding (by acquiring additional productive assets) in anticipation of higher future sales. An increasing ratio could also signal that a firm has cut back on capital expenditures due to a downturn in business. This is not the case at Southwest, which continues to expand its fleet. As a consequence, appropriate interpretation of the fixed asset turnover ratio requires an investigation of related activities.

*[Beginning + Ending Fixed Asset Balance (net of accumulated depreciation)] ÷ 2

**Selected Focus
Companies' Fixed Asset
Turnover Ratios for 2011**

Chipotle Mexican Grill 3.18



Deckers 19.96



Apple 17.26



LEARNING OBJECTIVE 8-2

Apply the cost principle to measure the acquisition and maintenance of property, plant, and equipment.

In addition to purchasing buildings and equipment, a company may acquire undeveloped land, typically with the intent to build a new factory or office building. When a company purchases land, all of the incidental costs of the purchase, such as title fees, sales commissions, legal fees, title insurance, delinquent taxes, and surveying fees, should be included in its cost.

Sometimes a company purchases an old building or used machinery for the business operations. Renovation and repair costs incurred by the company prior to the asset's use should be included as a part of its cost. Also, when purchasing land, building, and equipment as a group (known as a basket purchase), the total cost is allocated to each asset in proportion to the asset's market value relative to the total market value of the assets as a whole.

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The **ACQUISITION COST** is the net cash equivalent amount paid or to be paid for the asset.

Page 385

For the sake of illustration, let's assume that Southwest purchased a new 737 aircraft from Boeing on January 1, 2014 (the beginning of Southwest's fiscal year), for a list price of \$78 million. Let's also assume that Boeing offered Southwest a discount of \$4 million for signing the purchase agreement. That means the price of the new plane to Southwest would actually be \$74 million. In addition, Southwest paid \$200,000 to have the plane delivered and \$800,000 to prepare the new plane for use. The amount recorded for the purchase, called the **acquisition cost**, is the net cash amount paid for the asset or, when noncash assets are used as payment, the fair value of the asset given or asset received, whichever can be more clearly determined (called the **cash equivalent price**). Southwest would calculate the acquisition cost of the new aircraft as follows:

Invoice price	\$78,000,000
Less: Discount from Boeing	4,000,000
Net cash invoice price	74,000,000
Add: Transportation charges paid by Southwest	200,000
Preparation costs paid by Southwest	800,000
Cost of the aircraft (added to the asset account)	<u>\$75,000,000</u>

For Cash

Assuming that Southwest paid cash for the aircraft and related transportation and preparation costs, the transaction is recorded as follows:

	Debit	Credit
Flight Equipment (+A)	75,000,000	
Cash (-A)		75,000,000

Assets	=	Liabilities	+	Stockholders' Equity
Flight Equipment +75,000,000				
Cash -75,000,000				

It might seem unusual for Southwest to pay cash to purchase new assets that cost \$75 million, but this is often the case. When it acquires productive assets, a company may pay with cash that was generated from operations or cash recently borrowed. It also is possible for the seller to finance the purchase on credit.

For Debt

Now let's assume that Southwest signed a note payable for the new aircraft and paid cash for the transportation and preparation costs. In that case, Southwest would record the following journal entry:

	Debit	Credit
Flight Equipment (+A)	75,000,000	
Cash (-A)		1,000,000
Notes Payable (+L)		74,000,000

Assets		=	Liabilities		+	Stockholders' Equity	
Flight Equipment	+75,000,000		Notes Payable	+74,000,000			
Cash	-1,000,000						

Commercial airlines often utilize financing schemes that include leasing aircraft. Shorter-term leases, called **operating leases**, provide airlines with flexibility in managing fleet size and obsolescence, which can occur with changes in environmental and noise-level laws in various countries. Operating leases are not reported on the balance sheet as liabilities and the assets are not included in fixed assets. On the other hand, longer-term leases, called **financing leases** or **capital leases**, are in essence the acquisition of assets that are reported on the balance sheet along with the lease obligations, allowing for companies to take advantage of tax benefits. At December 31, 2011, Southwest Airlines disclosed the following regarding its leasing commitments:

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Page 386

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2011 Annual Report

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

8. Leases

The majority of the Company's and AirTran's terminal operations space, as well as 192 aircraft, were under operating leases at December 31, 2011 . . . Future minimum lease payments under capital leases and noncancelable operating leases with initial or remaining terms in excess of one year at December 31, 2011, were:

(in millions)	Capital leases	Operating leases
2012	\$ 6	\$ 640
2013	6	717
2014	6	642
2015	6	579
2016	6	489
Thereafter	<u>26</u>	<u>2,516</u>
Total minimum lease payments	<u>\$56</u>	<u>\$5,583</u>

Additional discussion of leases is provided in Chapter 9.

For Equity (or Other Noncash Considerations)

Noncash consideration, such as the company's common stock or a right given by the company to the seller to purchase the company's goods or services at a special price, might also be part of the transaction. When noncash consideration is included in the purchase of an asset, the cash-equivalent cost (fair value of the asset given or received) is determined.

Assume that Southwest gave Boeing 1,000,000 shares of its \$1.00 par value common stock with a market value of \$50 per share and paid the balance in cash. The journal entry and transaction effects follow:

	Debit	Credit
Flight Equipment (+A)	75,000,000	
Common Stock (+SE)		1,000,000
Additional Paid-In Capital (+SE)		49,000,000
Cash (-A)		25,000,000

Assets	=	Liabilities	+	Stockholders' Equity
Flight Equipment +75,000,000				Common Stock +1,000,000
Cash -25,000,000				Additional Paid-In Capital +49,000,000

By Construction

In some cases, a company may construct an asset for its own use instead of buying it from a manufacturer. When a company does so, the cost of the asset includes all the necessary costs

McDonald's Corporation

It's your turn to apply these concepts by answering the following questions. In a recent year, McDonald's Corporation purchased property, plant, and equipment priced at \$2.7 billion. Assume that the company also paid \$216 million for sales tax; \$20 million for transportation costs; \$12 million for installation and preparation of the property, plant, and equipment before use; and \$1 million in maintenance contracts to cover repairs to the property, plant, and equipment during use.

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Compute the acquisition cost for the property, plant, and equipment.

- How did you account for the sales tax, transportation costs, and installation costs?

Page 388

Explain.

- Under the following independent assumptions, indicate the effects of the acquisition on the accounting equation. Use + for increase and – for decrease and indicate the accounts and amounts:

	ASSETS	LIABILITIES	STOCKHOLDERS' EQUITY
a. Paid 30 percent in cash and the rest by signing a note payable.			
b. Issued 10 million shares of common stock (\$0.01 per share par value) at a market price of \$100 per share and paid the balance in cash.			

After you have completed your answers, check them with the solutions at the bottom of the page.

Repairs, Maintenance, and Improvements

Most assets require substantial expenditures during their lives to maintain or enhance their productive capacity. These expenditures include cash outlays for ordinary repairs and maintenance, major repairs, replacements, and additions. Expenditures that are made after an asset has been acquired are classified as follows:

ORDINARY REPAIRS AND MAINTENANCE

are expenditures that maintain the productive capacity of the asset during the current accounting period only and are recorded as expenses.

1. **Ordinary repairs and maintenance** are expenditures that maintain the productive capacity of the asset during the current accounting period only. These expenditures are recurring in nature, involve relatively small amounts at each occurrence, and do not directly increase the productive life, operating efficiency, or capacity of the asset. These cash outlays are recorded as **expenses** in the current period.

In the case of Southwest Airlines, examples of ordinary repairs would include changing the oil in the aircraft engines, replacing the lights in the control panels, and fixing torn fabric on passenger seats. Although the cost of individual ordinary repairs is relatively small, in the aggregate these expenditures can be substantial. In 2011, Southwest paid \$955 million for aircraft maintenance and repairs. This amount was reported as an expense on its income statement. The following summary entry represents how these expenditures would have been recorded by Southwest:

Solutions to SELF-STUDY QUIZ

1. Property, Plant, and Equipment (PPE)

Acquisition cost	\$2,700,000,000
Sales tax	216,000,000
Transportation	20,000,000
Installation	12,000,000
Total	<u>\$2,948,000,000</u>

Because the maintenance contracts are not necessary to ready the assets for use, they are not included in the acquisition cost.

2. Sales tax and transportation and installation costs are capitalized because they are reasonable and necessary for getting the asset ready for its intended use.
- 3.

	Assets		Liabilities		Stockholders' Equity	
a.	PPE	+2,948,000,000	Note Payable	+2,063,600,000		
	Cash	-884,400,000				
b.	PPE	+2,948,000,000			Common Stock	+100,000
	Cash	-1,948,000,000			Additional Paid-In Capital	+999,900,000

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<i>(in millions)</i>	<u>Debit</u>	<u>Credit</u>
Maintenance and Repairs Expense (+E, -SE)	955	
Cash (-A)		955

Page 389

<u>Assets</u>	=	<u>Liabilities</u>	+	<u>Stockholders' Equity</u>
Cash	-955			Maintenance and repairs expense (+E) -955

IMPROVEMENTS increase the productive life, operating efficiency, or capacity of the asset and are recorded as increases in asset accounts, not as expenses.

2. **Improvements** are expenditures that increase the productive life, operating efficiency, or capacity of the asset. These **capital expenditures** are added to the appropriate asset accounts (that is, they are capitalized). They occur infrequently, involve large amounts of money, and increase an asset's economic usefulness in the future through either increased efficiency or longer life. Examples include additions, major overhauls, complete reconditioning, and major replacements and improvements, such as the complete replacement of an engine on an aircraft.

Assume that Southwest spent \$300 million in 2011 to modify the exterior of its aircraft to reduce fuel consumption, resulting in 9 percent greater fuel efficiency and lower operating costs. The summary entry below represents how these expenditures would have been recorded by Southwest:

<i>(in millions)</i>	<u>Debit</u>	<u>Credit</u>
Flight Equipment (+A)	300	
Cash (-A)		300

<u>Assets</u>	=	<u>Liabilities</u>	+	<u>Stockholders' Equity</u>
Flight equipment	+300			
Cash	-300			

In many cases, no clear line distinguishes improvements (assets) from ordinary repairs and maintenance (expenses). In these situations, managers must exercise professional judgment and make a subjective decision. Capitalizing expenses will increase assets and net income in the current year, lowering future years' income by the amount of the annual depreciation. On the other hand, for tax purposes, expensing the amount in the current period will lower taxes immediately. Because the decision to capitalize or expense is subjective, auditors review the items reported as capital and revenue expenditures closely.



To avoid spending too much time classifying additions and improvements (capital expenditures) and repair expenses (revenue expenditures), some companies develop simple policies to govern the accounting for these expenditures. For example, one large computer company expenses all individual items that cost less than \$1,000. Such policies are acceptable because immaterial (relatively small dollar) amounts will not affect users' decisions when analyzing financial statements.

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through Capitalization

When expenditures that should be recorded as current period expenses are improperly capitalized as part of the cost of an asset, the effects on the financial statements can be enormous. In one of the largest accounting frauds in history, WorldCom (now part of Verizon) inflated its income and cash flows from operations by billions of dollars in just such a scheme. This fraud turned WorldCom's actual losses into large profits.

Over five quarters in 2001 and 2002, the company initially announced that it had capitalized \$3.8 billion that should have been recorded as operating expenses. By early 2004, auditors discovered \$74.4 billion in necessary restatements (reductions to previously reported pretax income) for 2000 and 2001.

Accounting for expenses as capital expenditures increases current income because it spreads a single period's operating expenses over many future periods as depreciation expense. It increases cash flows from operations by moving cash outflows from the operating section to the investing section of the cash flow statement.



PAUSE FOR FEEDBACK

Practice these applications for operational assets as they are used over time: repairing or maintaining (expensed in current period) and adding to or improving (capitalized as part of the cost of the asset).

SELF-STUDY QUIZ

A building that originally cost \$400,000 has been used over the past 10 years and needs continual maintenance and repairs. For each of the following expenditures, indicate whether it should be expensed in the current period or capitalized as part of **the cost of the asset**.

	Expense or Capitalize?
1. Major replacement of electrical wiring throughout the building.	_____
2. Repairs to the front door of the building.	_____
3. Annual cleaning of the filters on the building's air conditioning system.	_____
4. Significant repairs due to damage from an unusual and infrequent flood.	_____

After you have completed your answers, check them with the solutions at the bottom of the page.

USE, IMPAIRMENT, AND DISPOSAL OF PLANT AND EQUIPMENT

Depreciation Concepts

LEARNING OBJECTIVE 8-3

Apply various cost allocation methods as assets are held and used over time.

Except for land, which is considered to have an unlimited life, a long-lived asset with a limited useful life, such as an airplane, represents the prepaid cost of a bundle of future services or benefits. The **expense matching principle** requires that a portion of an asset's cost be allocated as an expense in the same period that revenues are generated by its use. Southwest Airlines earns revenue when it provides air travel service and incurs an expense when using its aircraft to generate the revenue.

Solutions to SELF-STUDY QUIZ

1. Capitalize
 2. Expense
 3. Expense
 4. Capitalize
-

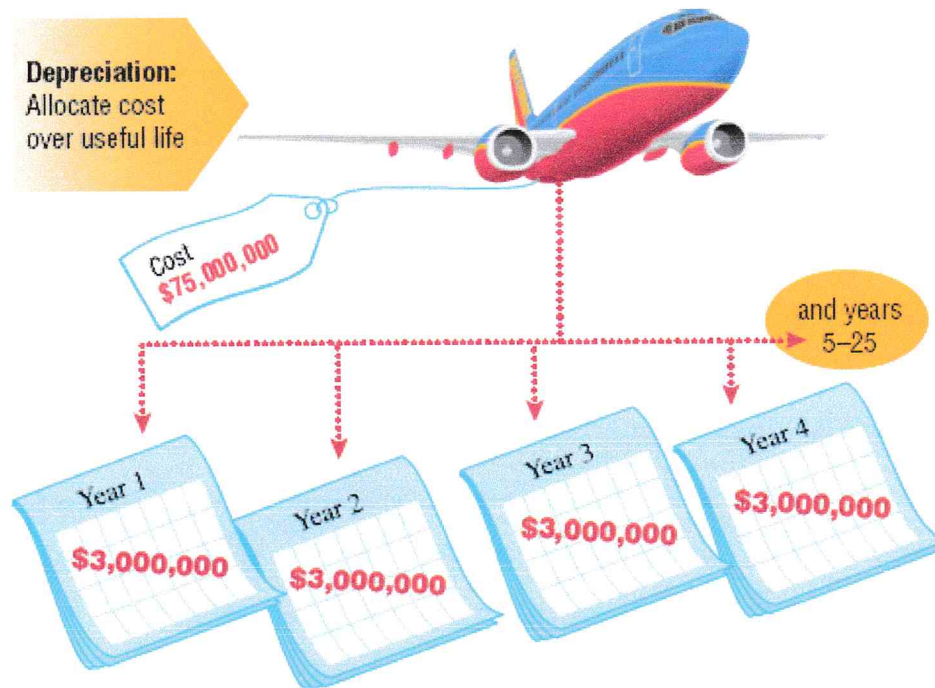
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DEPRECIATION is the process of allocating the cost of buildings and equipment over their productive lives using a systematic and rational method.

Page 391

The term used to identify the matching of the cost of using buildings and equipment with the revenues they generate is **depreciation**. Thus, depreciation is **the process of allocating the cost of buildings and equipment over their productive lives using a systematic and rational method**.



Using the asset → Depreciation Expense each year

Students often are confused by the concept of depreciation as accountants use it. In accounting, depreciation is a process of **cost allocation**, not a process of determining an asset's current market value or worth. When an asset is depreciated, the remaining balance sheet amount **probably does not represent its current market value**. On balance sheets subsequent to acquisition, the undepreciated cost is not measured on a market or fair value basis.

An adjusting journal entry is needed at the end of each period to reflect the use of buildings and equipment for the period:

	Debit	Credit
Depreciation Expense (+E, -SE)	x,xxx	
Accumulated Depreciation (+XA, -A)		x,xxx

Assets	=	Liabilities	+	Stockholders' Equity
Accumulated Depreciation (+XA) -x,xxx				Depreciation Expense (+E) -x,xxx

NET BOOK (or CARRYING)

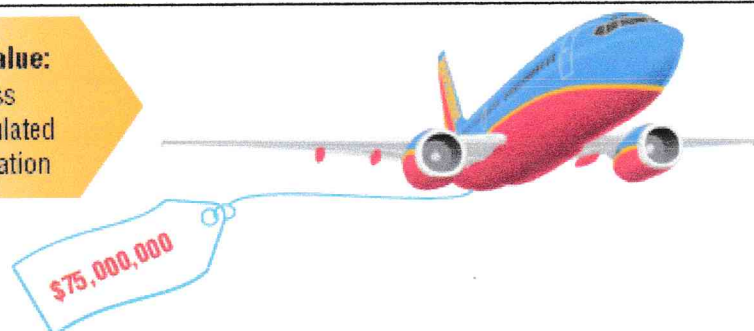
VALUE is the acquisition cost of an asset less accumulated depreciation.

The amount of depreciation recorded during each period is reported on the income statement as **Depreciation Expense**. The amount of depreciation expense accumulated since the acquisition date is reported on the balance sheet as a contra-account, **Accumulated Depreciation**, and deducted from the related asset's cost. The net amount on the balance sheet is called **net book value** or **carrying value**. The **net book (or carrying) value** of a long-lived asset is its acquisition cost less the accumulated depreciation from the acquisition date to the balance sheet date.

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Book Value:
Cost less
accumulated
depreciation



Page 392

	Year 1	Year 2	Year 3	Year 25
Cost	\$75,000,000	\$75,000,000	\$75,000,000	\$75,000,000
-Accumulated depreciation	3,000,000	6,000,000	9,000,000	75,000,000
Net book value	<u>\$72,000,000</u>	<u>\$69,000,000</u>	<u>\$66,000,000</u>	<u>\$ 0</u>

Reported on Balance Sheet

From Exhibit 8.1 on page 383, we see that Southwest's acquisition cost for property and equipment is \$18,421 million at the end of 2011. The accumulated depreciation and amortization on the property and equipment is \$6,294 million. Thus, the book value is reported at \$12,127 million. Southwest also reported depreciation and amortization expense of \$715 million on its income statement for 2011.

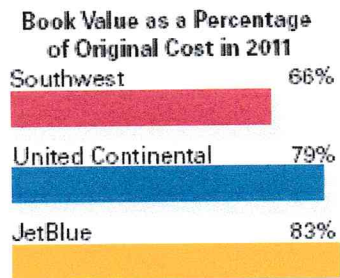
FINANCIAL ANALYSIS



Book Value as an Approximation of Remaining Life

Some analysts compare the book value of assets to their original cost as an approximation of their remaining life. If the book value of an asset is 100 percent of its cost, it is a new asset; if the book value is 25 percent of its cost, the asset has about 25 percent of its estimated life remaining. In Southwest's case, the book value of its property and equipment is 66 percent of its original cost, compared to 79 percent for United Continental and 83 percent for JetBlue Airways.

This comparison suggests that Southwest's flight equipment is older than the equipment at JetBlue and United Continental. This comparison is only a rough approximation and is influenced by some of the accounting issues discussed in the next section.



To calculate depreciation expense, three amounts are required for each asset:

1. Acquisition cost.
2. **Estimated** useful life to the company.
3. **Estimated** residual (or salvage) value at the end of the asset's useful life to the company.

Notice that the asset's useful life and residual value are estimates. Therefore, **depreciation expense is an estimate.**

ESTIMATED USEFUL LIFE is the expected service life of an asset to the present owner.

Estimated useful life represents management's estimate of the asset's useful **economic life** to the company rather than its total economic life to all potential users. The asset's expected physical life is often longer than the company intends to use the asset. Economic life may be expressed in terms of years or units of capacity, such as the number of hours a machine is

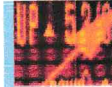
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expected to operate or the number of units it can produce. Southwest's aircraft fleet is expected to fly for more than 25 years, but Southwest wants to offer its customers a high level of service by replacing its older aircraft with modern equipment. For accounting purposes, Southwest uses a 23- to 30-year estimated useful life. The subsequent owner of the aircraft (likely a regional airline) would use an estimated useful life based on its own policies.

Page 393

FINANCIAL ANALYSIS



Differences in Estimated Lives within a Single Industry

Notes to recent actual financial statements of various airline companies reveal the following estimates for the useful lives of flight equipment:

Company	Estimated Life (in years)
Southwest	23 to 30
United Continental	30
Singapore Airlines	15

The differences in the estimated lives may be attributed to a number of factors such as the type of aircraft used by each company, equipment replacement plans, operational differences, and the degree of management's conservatism. In addition, given the same type of aircraft, companies that plan to use the equipment over fewer years may estimate higher residual values than companies that plan to use the equipment longer. For example, Singapore Airlines uses a residual value of 10 percent over a relatively short useful life for its passenger aircraft, compared to 5 percent for Delta Air Lines over a 25-year useful life.

Differences in estimated lives and residual values of assets can have a significant impact on a comparison of the profitability of the competing companies. Analysts must be certain to identify the causes of differences in depreciable lives.

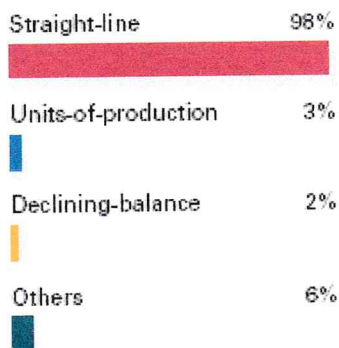
RESIDUAL (or SALVAGE)

VALUE is the estimated amount to be recovered by the company at the end of the asset's estimated useful life.

Residual (or salvage) value represents management's estimate of the amount the company expects to recover upon disposal of the asset at the end of its estimated useful life. The residual value may be the estimated value of the asset as salvage or scrap or its expected value if sold to another user. In the case of Southwest's aircraft, residual value may be the amount it expects to receive when it sells the asset to a small regional airline that operates older equipment. The notes to Southwest's financial statements indicate that the company estimates residual value to be between 0 and 15 percent of the cost of the asset, depending on the asset.

Alternative Depreciation Methods

Percentage of 500 Companies Using Alternative Depreciation Methods*



*Methods reported by companies sampled in *Accounting Trends & Techniques* (AICPA), 2012.

Because of significant differences among companies and the assets they own, accountants have not been able to agree on a single best method of depreciation. As a result, managers may choose from several acceptable depreciation methods that match depreciation expense with the revenues generated in a period. They may also choose different methods for specific assets or groups of assets. Once selected, the method should be applied consistently over time to enhance comparability of financial information. We will discuss the three most common depreciation methods:

1. Straight-line (the most common, used by more than 98 percent of companies surveyed for many or all of their assets).
2. Units-of-production.
3. Declining-balance.

To illustrate each method, let's assume that Southwest Airlines acquired a new service vehicle (ground equipment) on January 1, 2014. The relevant information is shown in Exhibit 8.2.

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Page 394**EXHIBIT 8.2**

Data for Illustrating the Computation of Depreciation under Alternative Methods

SOUTHWEST AIRLINES
Acquisition of a New Service Vehicle

Cost, purchased on January 1, 2014	\$62,500
Estimated residual value	\$ 2,500
Estimated useful life	3 years OR 100,000 miles
Actual miles driven in:	
Year 2014	30,000 miles
Year 2015	50,000 miles
Year 2016	20,000 miles

Straight-Line Method

The **STRAIGHT-LINE DEPRECIATION** method allocates the depreciable cost of an asset in equal periodic amounts over its useful life.

More companies, including Southwest, use **straight-line depreciation** in their financial statements than all other methods combined. Under the straight-line method, an equal portion of an asset's depreciable cost is allocated to each accounting period over its estimated useful life. Using the information in Exhibit 8.2, the formula to estimate annual depreciation expense follows:

Straight-Line Formula:

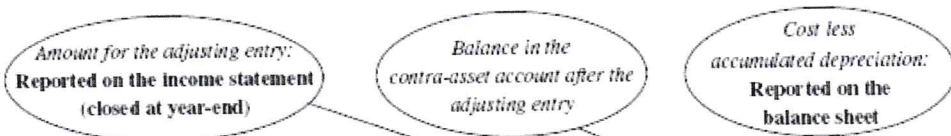
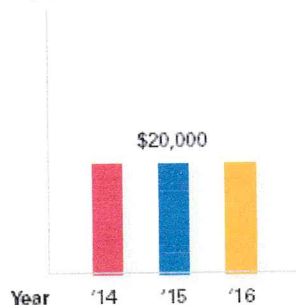
$$\underbrace{(\text{Cost} - \text{Residual Value})}_{\text{Depreciable Cost}} \times \underbrace{\frac{1}{\text{Useful Life}}}_{\text{Straight-Line Rate}} = \text{Depreciation Expense}$$

$$(\$62,500 - \$2,500) \times \frac{1}{3 \text{ Years}} = \$20,000 \text{ per year}$$

In this formula, “Cost minus Residual Value” is the amount to be depreciated, also called the **depreciable cost**. The formula “ $1 \div \text{Useful Life}$ ” is the **straight-line rate**. Using the data provided in Exhibit 8.2, the depreciation expense for Southwest's new truck would be \$20,000 per year.

Companies often create a **depreciation schedule** that shows the computed amount of depreciation expense each year over the entire useful life of the machine. You can use computerized spreadsheet programs, such as Excel, to create the depreciation schedule. Using the data in Exhibit 8.2 and the straight-line method, Southwest's depreciation schedule follows:

Straight-Line Expense



Straight-Line Method:

Year	Computation (Cost – Residual Value) × 1/Useful Life	Depreciation Expense	Accumulated Depreciation	Net Book Value
At acquisition				\$62,500
2014	$(\$62,500 - \$2,500) \times 1/3$	\$20,000	\$20,000	42,500
2015	$(\$62,500 - \$2,500) \times 1/3$	20,000	40,000	22,500
2016	$(\$62,500 - \$2,500) \times 1/3$	20,000	60,000	2,500
	Total	<u>\$60,000</u>		

Equal to estimated residual value at end of useful life

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Notice that

Page 395

- Depreciation expense is a constant amount each year.
- Accumulated depreciation increases by an equal amount each year.
- Net book value decreases by the same amount each year until it equals the estimated residual value.

This is the reason for the name **straight-line method**. Notice, too, that the adjusting entry can be prepared from this schedule, and the effect on the income statement and balance sheet are known. Southwest Airlines uses the straight-line method for all of its assets. The company reported depreciation expense in the amount of \$715 million for 2011, equal to 5 percent of the airline's revenues for the year. Most companies in the airline industry use the straight-line method.

Units-of-Production Method

The **UNITS-OF-PRODUCTION DEPRECIATION** method allocates the depreciable cost of an asset over its useful life based on the relationship of its periodic output to its total estimated output.

The **units-of-production depreciation** method relates depreciable cost to total estimated productive output. The formula to estimate annual depreciation expense under this method is as follows:

Units-of-Production Formula:

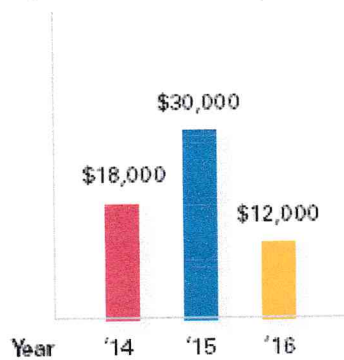
$$\frac{(\text{Cost} - \text{Residual Value})}{\text{Estimated Total Production}} \times \text{Actual Production} = \text{Depreciation Expense}$$

$$\frac{(\$62,500 - \$2,500)}{100,000 \text{ miles}} = \$0.60 \text{ per mile depreciation rate}$$

$$\$0.60 \text{ per mile} \times 30,000 \text{ actual miles in 2014} = \underline{\underline{\$18,000}} \text{ for 2014}$$

Dividing the depreciable cost by the estimated total production yields the **depreciation rate per unit of production**, which is then multiplied by the actual production for the period to determine depreciation expense. In our illustration, for every mile that the new vehicle is driven, Southwest would record depreciation expense of \$0.60. Based on the information in Exhibit 8.2, the depreciation schedule for the truck under the units-of-production method would appear as follows:

Units-of-Production Expense



Units-of-Production Method:				
Year	Computation [(Cost – Residual Value)/Total Estimated Production] × Actual Production	Depreciation Expense	Accumulated Depreciation	Net Book Value
At acquisition	RATE			\$62,500
2014	\$.60 per mile × 30,000 miles	\$18,000	\$18,000	44,500
2015	\$.60 per mile × 50,000 miles	30,000	48,000	14,500
2016	\$.60 per mile × 20,000 miles	12,000	60,000	2,500
	Total	<u>\$60,000</u>		

Equal to estimated residual value at end of useful life

Notice that, from period to period, depreciation expense, accumulated depreciation, and book value vary directly with the units produced. In the units-of-production method, depreciation expense is a **variable expense** because it varies directly with production or use.

You might wonder what happens if the total estimated productive output differs from actual total output. Remember that the estimate is management's best guess of total output. If any difference occurs at the end of the asset's life, the final adjusting entry to depreciation expense should be for the amount needed to bring the asset's net

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book value equal to the asset's estimated residual value. For example, if, in 2016, Southwest's truck ran 25,000 actual miles, the same amount of depreciation expense, \$12,000, would be recorded.

Page 396

Although Southwest does not use the units-of-production method, the Exxon Mobil Corporation, a major energy company that explores, produces, transports, and sells crude oil and natural gas worldwide, does, as a note to the company's annual report explains.

ExxonMobil

REAL WORLD EXCERPT
2011 Annual Report

1. Summary of Accounting Policies

Property, Plant, and Equipment

Depreciation, depletion, and amortization, based on cost less estimated salvage value of the asset, are primarily determined under either the unit-of-production method or the straight-line method, which is based on estimated asset service life taking obsolescence into consideration . . . Unit-of-production rates are based on the amount of proved developed reserves of oil, gas, and other minerals that are estimated to be recoverable from existing facilities using current operating methods.

The units-of-production method is based on an estimate of an asset's total future productive capacity or output, which is difficult to determine. This is another example of the degree of subjectivity inherent in accounting.

Declining-Balance Method

The **DECLINING-BALANCE DEPRECIATION** method allocates the net book value (cost minus accumulated depreciation) of an asset over its useful life based on a multiple of the straight-line rate, thus assigning more depreciation to early years and less depreciation to later years of an asset's life.

If an asset is considered to be more efficient or productive when it is newer, managers might choose the **declining-balance depreciation** method to match a higher depreciation expense with higher revenues in the early years of an asset's life and a lower depreciation expense with lower revenues in the later years. We say, then, that this is an **accelerated depreciation** method. Although accelerated methods are seldom used for financial reporting purposes, the method that is used more frequently than others is the declining-balance method.

Declining-balance depreciation is based on applying a rate exceeding the straight-line rate to the asset's net book value over time. The rate is often double (two times) the straight-line rate and is termed the **double-declining-balance rate**. For example, if the straight-line rate is 10 percent ($1 \div 10$ years) for a 10-year estimated useful life, then the declining-balance rate is 20 percent ($2 \times$ the straight-line rate). Other typical acceleration rates are 1.5 times and 1.75 times. The double-declining-

balance rate is adopted most frequently by companies employing an accelerated method, so we will use it in our illustration, with information from Exhibit 8.2.

Accumulated Depreciation increases over time

Double-Declining-Balance Formula:

$$(\text{Cost} - \text{Accumulated Depreciation}) \times \frac{2}{\text{Useful Life}} = \text{Depreciation Expense}$$

$$(\$62,500 - \$0 \text{ in 2014}) \times \frac{2}{3 \text{ years}} = \$41,667 \text{ in the first year}$$

There are two important differences between this method and the others described previously:

1. Notice that accumulated depreciation, not residual value, is included in the formula. Since accumulated depreciation increases each year, net book value (Cost minus Accumulated Depreciation) decreases. The double-declining rate is applied to a lower net book value each year, resulting in a decline in depreciation expense over time.

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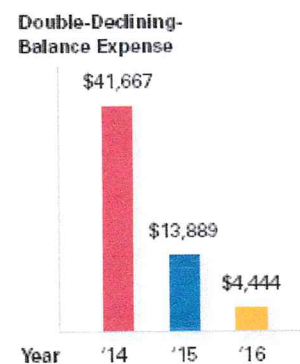
As with the other methods, the net book value should not be depreciated below the residual value:

Page 397

- Occasionally, before the end of the estimated useful life, if the annual computation reduces net book value below residual value, only the amount of depreciation expense needed to make net book value equal to residual value is recorded, and no additional depreciation expense is computed in subsequent years.
- More likely, in the last year of the asset's estimated useful life, whatever amount is needed to bring net book value to residual value is recorded, regardless of the amount of the computation.

Computation of double-declining-balance depreciation expense is illustrated in the depreciation schedule:

Year	Computation [(Cost - Accumulated Depreciation) × 2/Useful Life]	Depreciation Expense	Accumulated Depreciation	Net Book Value
At acquisition				\$62,500
2014	$(\$62,500 - \$0) \times 2/3$	\$41,667	\$41,667	20,833
2015	$(\$62,500 - \$41,667) \times 2/3$	13,889	55,556	6,944
2016	$(\$62,500 - \$55,556) \times 2/3$	4,629 4,444	60,185 60,000	2,315 2,500
Total		<u>\$60,000</u>		



Computed amount is too large

Equal to estimated residual value at end of useful life

The calculated depreciation expense for 2016 (\$4,629) is not the same as the amount actually reported on the income statement (\$4,444). An asset should never be depreciated below the point at which net book value equals its residual value. The asset owned by Southwest has an estimated residual value of \$2,500. If depreciation expense were recorded in the amount of \$4,629, the book value of the asset would be less than \$2,500. The correct depreciation expense for year 2016 is therefore \$4,444, the amount that will reduce the book value to exactly \$2,500. To determine the amount to record in 2016, indicate the amount needed for net book value (\$2,500), determine what the balance in accumulated depreciation should be to yield the \$60,000 (\$62,500 cost - \$2,500 residual value), and compute the amount of depreciation expense necessary to increase the balance in accumulated depreciation to \$60,000 (\$60,000 balance needed in accumulated depreciation - \$55,556 prior balance in accumulated depreciation).

Companies in industries that expect fairly rapid obsolescence of their equipment use the declining-balance method. Sony is one of the companies that uses this method, as a note to its annual report shows.

2. Summary of Significant Accounting Policies:***Property, Plant, Equipment and Depreciation***

Property, plant and equipment are stated at cost. Depreciation of property, plant and equipment is computed on the declining-balance method for Sony Corporation and its Japanese subsidiaries, except for certain semiconductor manufacturing facilities and buildings whose depreciation is computed on the straight-line method over the estimated useful life of the assets. Depreciation of property, plant and equipment for foreign subsidiaries is also computed on the straight-line method. Useful lives for depreciation range from 2 to 50 years for buildings and from 1 to 17 years for machinery and equipment.

REAL WORLD EXCERPT
Sony Corporation
2011 Annual Report

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As this note indicates, companies may use different depreciation methods for different classes of assets. Under the consistency principle, they are expected to apply the same methods to those assets over time.

Page 398

In Summary

The three depreciation methods, computations, and the differences in depreciation expense over time for each method are summarized as follows:

Method	Computation	Depreciation Expense
Straight-line	$(\text{Cost} - \text{Residual Value}) \times 1/\text{Useful Life}$	Equal amounts each year
Units-of-production	$[(\text{Cost} - \text{Residual Value})/\text{Estimated Total Production}] \times \text{Annual Production}$	Varying amounts based on production level
Double-declining-balance	$(\text{Cost} - \text{Accumulated Depreciation}) \times 2/\text{Useful Life}$	Declining amounts over time

FINANCIAL ANALYSIS



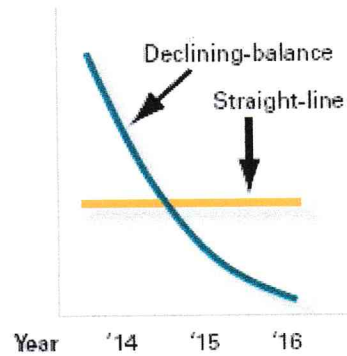
Impact of Alternative Depreciation Methods

Assume that you are comparing two companies that are exactly the same, except that one uses accelerated depreciation and the other uses the straight-line method. Which company would you expect to report a higher net income? Actually, this question is a bit tricky. The answer is that you cannot say for certain which company's income would be higher.

The accelerated methods report higher depreciation and therefore lower net income during the early years of an asset's life. As the age of the asset increases, this effect reverses. Therefore, companies that use accelerated depreciation report lower depreciation expense and higher net income during the later years of an asset's life. The graph in the margin shows the pattern of depreciation over the life of an asset for the straight-line and declining-balance methods discussed in this chapter. When the curve for the accelerated method falls below the line for the straight-line method, the accelerated method produces a higher net income than the straight-line method. However, total depreciation expense by the end of the asset's life is the same for each method.

Users of financial statements must understand the impact of alternative depreciation methods used over time. **Differences in depreciation methods rather than real economic differences can cause significant variation in reported net incomes.**

Summary Depreciation Expense

PAUSE FOR **FEEDBACK**

The three cost allocation methods discussed in this section are:

- Straight-line $(\text{Cost} - \text{Residual Value}) \times 1/\text{Useful Life}$
- Units-of-production $[(\text{Cost} - \text{Residual Value})/\text{Estimated Total Production}] \times \text{Annual Production}$
- Double-declining-balance $(\text{Cost} - \text{Accumulated Depreciation}) \times 2/\text{Useful Life}$

Practice these methods using the following information.

SELF-STUDY QUIZ

Assume that Southwest has acquired new computer equipment at a cost of \$240,000. The equipment has an estimated life of six years, an estimated operating life of 50,000 hours, and an estimated

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residual value of \$30,000. Determine depreciation expense for the first full year under each of the following methods:

Page 399

1. Straight-line method.
2. Units-of-production method (assume the equipment ran for 8,000 hours in the first year).
3. Double-declining-balance method.

After you have completed your answers, check them with the solutions at the bottom of the page.

GUIDED HELP



www.mhhe.com/libby8e

For additional step-by-step video instruction on using the three cost allocation methods discussed in this section, go to the URL or scan the QR code in the margin with your smartphone or iPad.

FINANCIAL ANALYSIS



Increased Profitability Due to an Accounting

Adjustment? Reading the Notes

Financial analysts are particularly interested in changes in accounting estimates because they can have a large impact on a company's before-tax operating income. In 2001, Singapore Airlines disclosed in its annual report that it had increased the estimated useful life of its aircraft from 10 to 15 years to reflect a change in its aircraft replacement policy. The change reduced depreciation expense for the year by \$265 million and would reduce expenses by a similar amount each year over the remaining life of the aircraft. Analysts pay close attention to this number because it represents increased profitability due merely to an accounting adjustment.



INTERNATIONAL PERSPECTIVE



Component Allocation

Under IFRS, the cost of an individual asset's components is allocated among each significant component and then depreciated separately over that component's useful life. For example, British Airways (now merged into International Airlines Group) separates the cost of an aircraft between its body and engines and interior cabin space. It then depreciates the body and engines over 18 to 25 years and the cabin interior over 5 years.

How Managers Choose

Financial Reporting

For financial reporting purposes, corporate managers must determine which depreciation method provides the best matching of revenues and expenses for any given asset. If the asset is expected to provide benefits evenly over time, then the straight-line method is preferred. Managers also find this method to be easy to use and to explain. If no other method is more systematic or rational, then the straight-line method is selected. Also, during the early years of an asset's life, the straight-line method reports higher income than the accelerated methods do. For these reasons, the straight-line method is, by far and away, the most common.

On the other hand, certain assets produce more revenue in their early lives because they are more efficient than in later years. In this case, managers select an accelerated method to allocate cost.

Solutions to SELF-STUDY QUIZ

1. $(\$240,000 - \$30,000) \times 1/6 = \$35,000$
 2. $[(\$240,000 - \$30,000) \div 50,000] \times 8,000 = \$33,600$
 3. $(\$240,000 - \$0) \times 2/6 = \$80,000$
-

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Tax Reporting

Page 400

Southwest Airlines, like most public companies, maintains two sets of accounting records. Both sets of records reflect the same transactions, but the transactions are accounted for using two different sets of measurement rules. One set is prepared under GAAP for reporting to stockholders. The other set is prepared to determine the company's tax obligation under the Internal Revenue Code. The reason that the two sets of rules are different is simple: The objectives of GAAP and the Internal Revenue Code differ.

Financial Reporting (GAAP)	Tax Reporting (IRC)
The objective of financial reporting is to provide economic information about a business that is useful in projecting future cash flows of the business. Financial reporting rules follow generally accepted accounting principles.	The objective of the Internal Revenue Code is to raise sufficient revenues to pay for the expenditures of the federal government. Many of the Code's provisions are designed to encourage certain behaviors that are thought to benefit society (e.g., contributions to charities are made tax deductible to encourage people to support worthy programs).

In some cases, differences between the Internal Revenue Code and GAAP leave the manager no choice but to maintain separate records. In other cases, the differences are the result of management choice. When given a choice among acceptable tax accounting methods, managers apply what is called the **least and the latest rule**. All taxpayers want to pay the lowest amount of tax that is legally permitted and at the latest possible date. If you had the choice of paying \$100,000 to the federal government at the end of this year or at the end of next year, you would choose the end of next year. By doing so, you could invest the money for an extra year and earn a significant return on the investment.

A QUESTION OF ETHICS



Two Sets of Books

When they first learn that companies maintain two sets of books, some people question the ethics or legality of the practice. In reality, **it is both legal and ethical to maintain separate records for tax and financial reporting purposes. However, these records must reflect the same transactions.** Understating revenues or overstating expenses on a tax return can result in financial penalties and/or imprisonment. Accountants who aid tax evaders also can be fined or imprisoned and lose their professional licenses.

Similarly, by maintaining two sets of books, corporations can defer (delay) paying millions and sometimes billions of dollars in taxes. The following companies reported significant gross deferred tax obligations in 2011. Much of these deferrals were due to differences in asset cost allocation methods:

Company	Deferred Tax Liabilities	Percentage Due to Applying Different Cost Allocation Methods
Southwest Airlines	\$3,621 million	98%
PepsiCo	7,816 million	32
Hertz	3,685 million	74
Marriott International	18 million	56

Most corporations use the IRS-approved Modified Accelerated Cost Recovery System (MACRS) to calculate depreciation expense for their tax returns. MACRS is similar to the

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declining-balance method and is applied over relatively short asset lives to yield high depreciation expense in the early years. The high depreciation expense reported under MACRS reduces a corporation's taxable income and therefore the amount it must pay in taxes. MACRS provides an incentive for corporations to invest in modern property, plant, and equipment in order to be competitive in world markets. However, **it is not acceptable for financial reporting purposes.**

Page 401

Measuring Asset Impairment

LEARNING OBJECTIVE 8-4

Explain the effect of asset impairment on the financial statements.

As we discussed in Chapter 2, assets are defined as economic resources with probable future benefits acquired in an exchange transaction. On the date of the exchange, an asset is measured at historical cost. However, later in its useful life, when an asset is not expected to generate sufficient cash flows (probable future benefits) at least equal to its book value, we say the asset's book value is impaired. Corporations must review long-lived tangible and intangible assets for possible impairment. Two steps are necessary:

Step 1: Test for Impairment Impairment occurs when events or changed circumstances cause the estimated future cash flows (future benefits) of these assets to fall below their book value.

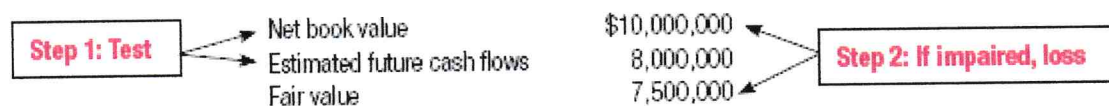
If net book value > Estimated future cash flows, then the asset is impaired.

Step 2: Computation of Impairment Loss For any asset considered to be impaired, companies recognize a loss for the difference between the asset's book value and its **fair value** (a market concept).

$$\text{Impairment Loss} = \text{Net Book Value} - \text{Fair Value}$$

That is, the asset is **written down** to fair value.

To illustrate measuring impairment losses, let's assume that Southwest did a review for asset impairment and identified an aircraft with the following information:



Step 1:

Since the net book value of \$10 million exceeds the estimated future cash flows of \$8 million, then the asset is impaired because it is not expected to generate future benefits equal to its net book value. When impaired, proceed to Step 2.

Step
2:

If impaired, the amount of the impairment loss is the difference between net book value and the asset's fair value. For Southwest, determining fair value includes using published sources and third-party bids to obtain the value of the asset. If the asset's fair value was \$7,500,000, then the loss is calculated as \$2,500,000 (\$10,000,000 net book value less \$7,500,000 fair value). The following journal entry would be recorded:

	Debit	Credit
Asset Impairment Loss (+Loss, -SE)	2,500,000	
Flight Equipment (-A)		2,500,000

Assets	=	Liabilities	+	Stockholders' Equity
Flight Equipment				Asset Impairment Loss (+E)
-2,500,000				-2,500,000