Maintenance Guide for Users of Manual and Power Wheelchairs

March 2018

wheelchair

This fact sheet explains

the importance of

maintenance. It

identifies when to

inspect specific parts and functions and signs

of problems to look for.

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SCI Fact Sheet

Introduction

Wheelchair breakdowns can injure wheelchair users and limit mobility and social participation. Poor wheelchair maintenance increases the risk of wheelchair breakdowns and personal injury or death, and increases the costs of medical care. The number of users injured from wheelchair breakdowns doubled from 1991 to 2016.

According to a 2016 study, up to 18% of wheelchair users experience a wheelchair-related injury each year. Furthermore, 44–57% reported at least one wheelchair breakdown in the past 6 months. Of these, 20–30% of users stated that because of the breakdown, they missed work and appointments, were stranded at home or away from home, or were injured.¹

Importance of maintaining a wheelchair

If you use a wheelchair (or know somebody who does), then you should develop the skills and knowledge to perform basic wheelchair maintenance. Wheelchair maintenance can reduce wheelchair breakdowns and related consequences, as well as costs for repairs and replacement.

If you are able to, you should regularly inspect all of the components on the wheelchair to make sure they work right. If you need assistance, consider asking a caregiver, friend, or family member for help with checking your wheelchair. If there is a problem, you should either fix it or take the wheelchair to a maintenance expert.

When to perform maintenance and what to look for

You'll need tools to perform basic maintenance on your wheelchair. Helpful tools might include screwdrivers, Allen wrenches, combination wrenches, lubricant, a tire lever, a tire pump, a tire patch kit, a bucket with water, and a cloth. When transferring out of the wheelchair to do maintenance, always sit on a stable and protected surface.

The following sections provide details about maintaining manual and power wheelchairs. The sections identify when to inspect specific parts and functions and what signs of problems to look for.

Do not try to fix or replace any wheelchair part if you don't feel comfortable doing it. Make plans to have the wheelchair serviced completely by a wheelchair maintenance expert once a year. A wheelchair maintenance expert may include your wheelchair vendor or manufacturer, an occupational or physical therapist, or another employee at a wheelchair seating clinic.

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¹ Toro, M. L., Worobey, L., Boninger, M. L., Cooper, R. A., & Pearlman J. (2016). Type and frequency of reported wheelchair repairs and related adverse consequences among people with spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, *97*(10):1753–1760. doi: 10.1016/j.apmr.2016.03.032





Model Systems Knowledge Translation Center

The Spinal Cord Injury Model System is sponsored by the National Institute of **Disability**, Independent Living, and Rehabilitation Research; **U.S. Department of** Health and Human Services: Administration for Community Living. (See http://www.msktc.org/ sci/model-systemcenters for more information).

Manual wheelchairs: Areas for maintenance

Inspect every part of the wheelchair. Make sure that all nuts and bolts are tight, but not too tight.

Rear wheels

Timing	Part/Area	What to Do
Weekly	Tire pressure (for pneumatic tires)	 Check the pressure by pressing down firmly on the tire with your thumb. If you can press down more than 5 mm (roughly the thickness of three pennies stacked together), then the tire needs to be pumped up with air. Use a bike pump to add air to the tire. Not all tires are the same; the appropriate pressure should be listed on your tire. If you find that your tire is not holding air, the inner tube may have a hole and you should patch it or replace it. If the tire lacks sufficient pressure, the wheelchair will be difficult to maneuver, propelling the wheelchair will take more energy, it will stress the user's shoulders more, and increase risk for shoulder pain.
Monthly	Tires	 Inspect the rear tires for wear, cracks, bulges, looseness, damage, and flat spots. Problems can occur when tread becomes worn, cracked, or loose, or when the sidewalls begin to bulge out when pumped with air. Worn out tires can make the wheelchair harder to propel. If you find issues with the tires, contact a maintenance expert to replace them. In some cases, a bicycle shop may be able to help with repairs.
Monthly	Bearings	 Lift one side of the wheelchair off the ground. Spin the wheel, and let it rotate to a stop. If the wheel slows and stops quickly when spun, then the nut and bolt holding the bearing could be too tight. If the wheel slows and rotates backwards slightly when spun, then the bearing is not being compressed and could be too loose. Repeat the same procedure with the other wheel. Bearings will wear out during normal use. Noise can be the first sign that a bearing is failing and can include a knocking sound or a squeaky, squealing moan. If you find an issue with the bearing, it should be replaced.
Monthly	Spokes	 Gently squeeze two pairs of spokes together all the way around the wheel. If a spoke "gives," it may be too loose. Spokes have a domino effect; if you find one loose one, others will follow. Loose spokes can make the wheelchair harder to propel, or cause the wheel to collapse. If spoke tension is unequal, you may hear a faint, metallic, snapping sound as you move. A bicycle store or shop can be a useful resource to get spokes tightened for pneumatic tires. Check to make sure that spokes aren't bent.
Monthly	Alignment	 Check wheel alignment by rolling through a puddle of water and allowing the wheelchair to coast. Examine the tracks left on the ground by the wet tires. The tracks should maintain a steady path. If they don't, contact a maintenance expert. Misalignment can lead to the user having to push more to travel straight, wasting energy.
Monthly	Axle (fixed and quick- release)	 Hold the wheel away from the hub and wiggle it in all directions. For a fixed axle, there should not be any play in the wheel. For a quick-release axle, some play is acceptable. Check that the quick-release mechanism works correctly. The axles should slide smoothly through the wheel housing and then click and latch into place. Contact a maintenance expert if the wheels are not securely latching as the wheel can come off, which can lead to an accident.
Monthly	Folding and moving parts	 Clean, dry, and lubricate all moving parts with either oil or a Teflon-based spray. Pay close attention to all folding parts, the rear axle, the front casters, and any exposed hinges. Lubrication is important because increased friction between moving parts can accelerate wear.
Monthly	Wheel locks	 Make sure the wheel locks are secured tightly to the frame. Apply the lock and check that it holds the tires firmly in place. You should be able to set the wheel locks easily. The wheel locks should not get in the way of the tires while rolling. Ensuring that wheel locks are working properly is important as they act as parking brakes and help users when transferring to other surfaces, or when users want to remain in a particular spot.
Monthly	Handrim	 While propelling, make sure the handrim is firm (not loose). The surface of the handrim should be smooth (not rough). Cracks can cause harm to the user and a loose handrim can make it more difficult for the user to grasp the handrim, which may cause the user's hand to fall off, which could result in a loss of balance and increase risk for falling.







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Caster wheels			
Timing	Part/Area	What to Do	
Monthly	Wheels	 Inspect caster wheels for wear, cracks, looseness, bulges, and tears. Worn out caster wheels can make the wheelchair harder to propel. Check for caster flutter. Flutter is the shimmy or rapid vibration of the caster wheels. 	
		 Make sure the wheels touch the floor evenly when on a flat surface and that the caster forks (which connect the caster wheel to the frame) are aligned vertically. If either of these conditions are present, it can decrease the wheelchair's stability and performance. 	
Monthly	Axle bearings	• Remove dirt, lint, and hair from the axle bearings with scissors, tweezers, a toothbrush, or pliers. These substances can wear out the bearing and make the wheelchair hard to maneuver.	
Monthly	Anti-tip mechanism	 Inspect the pins to make sure that they work and can be put on and off. Make sure the rollers aren't broken. Issues with the anti-tip mechanism can affect its ability to prevent tipping accidents. 	

Cushion

Timing	Part/Area	What to Do
Weekly	Cushion	Remove the cover so you can inspect it as well as the cushion. The cover protects the cushion.
	and cover (inspect)	• Fix tears or holes in the cover and check for flaking in the liner. Make sure the zipper works right. A damaged cover or zipper might create a wrinkled sitting surface.
		 If you have an air cushion, keep it properly inflated and make sure the valve is in good condition and doesn't leak. If you suspect that there is a leak, remove the cover, submerge the cushion in water, and look for bubbles. If it is an air filled cushion, you may be able to patch the leak.
		 If you have a gel cushion, knead the gel daily so it moves under bony prominences. Inspect the gel to make sure it's not hard and there are no leaks. If you find a leak, contact your wheelchair maintenance expert immediately to have it repaired or replaced.
		 If you have a foam cushion, inspect the foam to make sure it's intact and not deteriorating and chipping. When you press it, it should bounce back.
		 If you have a solid seat insert, check for cracks and make sure the cushion has the right shape and contour.
		 After inspecting the cushion, place it back on the wheelchair properly.
		 You may want to have a back-up cushion to use while the main cushion is being cleaned.
		 Cushions are an important part of the wheelchair. But cushions don't last as long as the frame. The interaction between the cushion and the user's body determines the user's comfort, function, and safety. If you find a problem, you should contact a wheelchair maintenance expert immediately to get the cushion replaced. Deterioration in the cushion can increase the risk of the user developing a pressure sore.
Monthly	Cushion and cover (clean)	 Wipe down the cushion with a clean, damp cloth and soap. You can put the cover in the washing machine but NOT in the dryer as the fabric may shrink and not fit the cushion anymore. Instead, dry the cushion on a towel in the shade. Avoid direct sunlight.
		 Dirt on the cushion can cause skin breakdown and leave an odor on both the wheelchair and cushion.
		 You may want to have a back-up cushion to use while the main cushion is being cleaned.

Supports

Timing	Part/Area	What to Do
Monthly	Foot supports	• The foot supports are often the first part of the wheelchair to encounter an obstacle. This is because they are used to open doors, they act as bumpers, and they scrape along the ground).
		• Make sure that the foot supports are intact and tightened, can be released (if originally designed to do so) and put back into place with ease, and can be latched easily.
		 Inspect the swing-away foot support. Look for wear on the pin, bolt, and bushing.
		 Inspect the heel loop, and if it is worn and flat or broken, contact a wheelchair maintenance expert immediately to replace the strap. The pin holding the strap can injure the user's foot.



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Timing	Part/Area	What to Do
Monthly	Arm supports	 The main purpose of the arm supports is to provide good resting posture for the arms. In addition, arm supports provide convenient handles when the rider leans to one side or the other. They are also helpful when a user attempts to reach higher places and help some users with transfers.
		 Make sure that the arm supports are intact and tightened, can be released (if originally designed to do so) and put back into place with ease, and can be latched easily.
		 Get rid of any sharp edges that could cause harm.
Monthly	Back support	 The back support provides comfort and postural support while sitting.
		 Make sure the surface of the back support is intact.
		 Ensure that the hardware for the back support is attached properly to the posts and doesn't rattle.
Monthly	All supports	Wipe down all supports with a clean, damp cloth and soap.
	(clean)	 Cleaning the wheelchair may stop metal parts from rusting and may stop damage caused by dirt scraping against moving parts.
Monthly	Upholstery	 Inspect upholstery for wear and tears.
	(including stitching and	 Make sure that fabric is not stretched out and that metal parts aren't sticking out. Loose upholstery can lead to skeletal deformities.
	rivets)	 Clean upholstery with a clean, damp cloth with or without soap.
Monthly	Clothing guard	 Clothing guards provide a barrier between the wheelchair user and the wheel. They help to protect the user's clothing from the wheels.
		 Tighten nuts and bolts as needed.

Frame

Timing	Part/Area	What to Do
Monthly	Welds	 All common wheelchair frames center around tubular construction. The tubing can either be welded together or bolted together using lugs.
		 Inspect the frame, weld points, and all holes and bends to confirm that they're intact.
		 Look for cracks and fractures. If these aren't fixed, the wheelchair can completely fail, which may lead to catastrophic injury or death.
Monthly	Cross-brace	• The cross-brace is a hinged, x-shaped support between the two side frames. It allows the wheelchair to fold.
		 Move the cross-brace to make sure it works correctly. It should open and fold easily.
		• Problems with the cross-brace mechanism may cause the wheelchair to collapse and lead to injury to the user or interfere with proper folding for storage.
Monthly	Suspension	 Make sure the paint in the springs is intact and has no cracks.
		 Inspect the damper to make sure it's not leaking lubricant.
		• Suspension elements decrease shock and vibration and make for a smoother ride. The suspension should be inspected by a wheelchair maintenance expert following a significant weight change (gain or loss).
		• Be aware that when going over obstacles—for example, a speed bump—the wheelchair should not make noises. If it does, it may not be safe. At least three wheels should touch the ground at all times.
Monthly	Whole frame	Wipe down the entire frame with a clean, damp cloth and soap.
		• Cleaning the wheelchair may stop metal parts from rusting and may stop damage caused by dirt scraping against moving parts.



Power wheelchairs: Areas for maintenance

Before doing any maintenance, turn the power switch to OFF and remove the charger cords. Inspect every part of the wheelchair. Make sure that the nuts and bolts are tight, but not too tight.

Rear wheels

Timing	Part/Area	What to Do	
Weekly	Tire pressure (for pneumatic tires)	 Most power wheelchair tires are solid; however, some are pneumatic. Check the pressure by pressing down firmly on the tire with your thumb. If you can press down more than 5 mm (roughly the thickness of three pennies stacked together), then the tire needs to be pumped up with air. Use a bike pump to add air to the tire. 	
Monthly	Tires	 Inspect the rear tires for wear, cracks, bulges, looseness, damage, and flat spots. Problems can occur when tread becomes worn, cracked, or loose, or when the sidewalls begin to bulge out when pumped with air. 	
		 When tire tread depth is low, it can easily lead to power chair slippage, making braking distances longer. Wear can also negatively affect the wheelchair's maneuverability and stability. 	
		Contact a maintenance expert to replace the tires.	

Caster wheels

Timing	Part/Area	What to Do
Monthly	Wheels	 Inspect caster wheels for wear, cracks, looseness, bulges, and tears.
		Check for caster flutter. Flutter is the shimmy or rapid vibration of the caster wheels.
		• Excessive flutter can cause the wheelchair to move in an unwanted direction. This might cause a collision and injure the user.
		 Contact a wheelchair maintenance expert to get caster wheels repaired.
Monthly	Axle	Remove dirt, lint, and hair from the axle bearings with scissors, tweezers, a toothbrush, or pliers.
	bearings	• Dirt, lint, or hair buildup on the axles and casters can eventually cause premature wear. In particular, hair can twist around the bearings and cause breakage.
		• Bearings will wear out on a caster wheel during normal use. Problems in the bearings are identified when noises like clicking or grinding are present. Bearings should be replaced before they fail.
Monthly	Anti-tip mechanism	 Check that the anti-tip wheels aren't loose and do not squeak or drag. If wheels are loose, use an Allen wrench or open-end box-end wrench to tighten any screws until snug.
		Make sure the wheels aren't cracked or worn out.
		• When anti-tip casters are in use and properly adjusted, they should help prevent wheelchair tipping incidents. However, anti-tip casters do not prevent all tipping incidents from occurring. Always make sure to exercise caution.
		 Contact a wheelchair maintenance expert to get the anti-tip mechanism replaced.





Timing	Part/Area	What to Do
Weekly	Cushion and cover (inspect)	 Remove the cover so you can inspect it and the cushion. The cover protects the cushion. Fix tears or holes in the cover and check for flaking in the liner. Make sure the zipper works correctly. A damaged cover or zipper might create a wrinkled sitting surface.
		 If you have an air cushion, keep it properly inflated and make sure the valve is in good condition and doesn't leak. If you suspect that there is a leak, remove the cover, submerge the cushion in water, and look for bubbles. If it is an air filed cushion, you may be able to patch the leak.
		• If you have a gel cushion, knead the gel daily so it moves under bony prominences. Inspect the gel to make sure it's not hard and there are no leaks.
		 If you have a foam cushion, inspect the foam to make sure it's intact and not deteriorating and chipping. When yo press it, it should bounce back.
		• If you have a solid seat insert, check for cracks and make sure the cushion has the right shape and contour.
		• Be aware of the direction of the cushion. After inspecting it, place the cushion back on the wheelchair properly.
		 You may want to have a back-up cushion to use while the main cushion is being cleaned.
		 Cushions are an important component of the wheelchair. But cushions do not last as long as the frame. The interaction between the cushion and the user's body determines the user's comfort, function, and clinical safety. If you find a problem, contact a wheelchair maintenance expert immediately to get the cushion replaced. Deterioration in the cushion can increase the risk of the user developing a pressure sore.
Monthly	Cushion and cover (clean)	• Wipe down the cushion with a clean, damp cloth and soap. You can put the cover in the washing machine but NOT in the dryer as the fabric may shrink and not fit the cushion anymore. Instead, dry the cushion on a towel in the shade. Avoid direct sunlight.
		• Dirt on the cushion can cause skin breakdown and leave an odor on both the wheelchair and cushion.

Supports

Timing	Part/Area	What to Do
Monthly	Foot supports	• Make sure that the foot supports are intact and tightened, can be released (if originally designed to do so) and put back into place with ease, and can be latched easily.
		 Inspect the swing-away foot support. Look for wear on the pin, bolt, and bushing.
Monthly	Arm supports	• Make sure that the arm supports are intact and tightened, can be released (if originally designed to do so) and put back into place with ease, and can be latched easily.
		Get rid of any sharp edges that could cause harm.
Monthly	Back support	 Make sure the surface of the back support is intact.
		 Ensure that the back support hardware is attached properly to the posts and doesn't rattle.
Monthly	Other supports	 Inspect swing-away or flip-up supports to make sure they move freely but aren't too loose to rattle. Inspect fixed supports to make sure they're tightened. Nuts and bolts can work themselves loose or even all the way out, which could cause the support to fall off. Do not over-tighten a loose nut or bolt because that could damage the housing and/or break the bolt. Use an Allen wrench or open-end box-end wrench to tighten bolts.
Monthly	All supports (clean)	Wipe down the supports with a clean, damp cloth and soap.
Monthly	Positioning belt	Check the buckle latches and the hardware that attaches the strap to the frame. These parts should be in good shape. The latch on the belt should not slip or become unlatched easily.
		Inspect the strap and Velcro (when applicable) for any signs of wear.
Monthly	Upholstery	Clean upholstery with a clean, damp cloth and soap.





Frame			
Timing	Part/Area	What to Do	
Daily	Shrouds	 A shroud is a piece of the wheelchair, usually made of plastic, that covers parts of the wheelchair that shouldn't be exposed, such as joints or electronics. Check that shrouds are attached and intact. Wiggle the shrouds to make sure they're not loose. Damage to the plastic covers or shrouds will allow moisture and dirt to damage the frame or electronics. Contact a wheelchair maintenance expert to replace damaged shrouds. 	
Monthly	Welds	 Inspect the frame, weld points, and all holes and bends to confirm that they're intact. Look for cracks and fractures. If these aren't fixed, the wheelchair can completely fail, which may lead to catastrophic injury or death. If you find problems, contact a wheelchair maintenance expert immediately. 	
Quarterly	Suspension	 Power wheelchairs have suspension to improve ride comfort, reduce driving fatigue, and handle rough terrain. Make sure the paint in the springs is intact and has no cracks. Inspect the damper to make sure it's not leaking lubricant. Be aware that when going over obstacles—for example, a speed bump—the wheelchair should not make noises. If it does, it may not be safe. At least three wheels should touch the ground at all times. If you have had significant changes in weight, the suspension may not provide the same ride comfort. Contact a maintenance expert regarding issues with suspension. 	
Monthly	Whole frame	 Wipe down the entire frame with a clean, damp cloth and soap. Cleaning the wheelchair may stop metal parts from rusting and may stop damage caused by dirt scraping against moving parts. 	

Electrical system

Timing	Part/Area	What to Do		
Daily	Motor disengage levers	 Make sure the wheelchair can't move by itself when the lever is engaged. Make sure it can move when the lever is disengaged. 		
Daily	Motor noise	 The motors are the heart of any power wheelchair. They convert the electrical energy of the batteries to mechanical work. In many cases, one motor is used to drive each wheel. Motor failure can leave the wheelchair user stranded. 		
		 Listen to your motor. Become familiar with the healthy sound of your wheelchair when it's new. Over time, just like a car, the motor will become a little noisier. But if your ear is tuned to how it should sound, you'll know when there is excessive noise. Increased noise might indicate worn bearings, out-of-line belts or gears, or problems with the frame. 		
		 If you hear any unfamiliar or unrecognized noises, contact a wheelchair maintenance expert. 		
Daily	Driving and braking systems	 Turn down the speed. Command the wheelchair to go forward with the joystick or alternative control system (e.g. head control), until you hear the brakes click, then immediately (choose one) Release the joystick, Put the joystick in reverse, or Turn the wheelchair off (recommended). This is the only way to check if the brakes work right away. 		
Daily	Power seat functions	Inspect the full range of all power seat functions. First tilt, then recline, and finally elevate the legs.		





Electrical system (continued)	Electrical	system	(continued)
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Timing	Part/Area	What to Do
Daily	Controller, joystick, other controls, indicators, and horn	 Inspect all controls, indicators, driving features, and the horn to make sure they are working smoothly and consistently.
		 To inspect the joystick, turn OFF the controller. Check the joystick and rubber boot around the base of the joystick for damage. The joystick should return freely to neutral without binding. Check that the seal on the joystick is intact The seal protects the joystick from dirt and water.
		Check that all switches and controls are tightly in place.
		• Joystick problems may cause a malfunction in the wheelchair's operation as well as damage to the electronics.
		• To avoid excessive moisture in the controller, always carry a gallon-size plastic bag to cover the joystick and controller if it rains to prevent moisture accumulation. If the joystick/controller gets wet, use a hair dryer to blow through the charge/controller plug.
Daily	Battery charge	• Batteries are the fuel system for power wheelchairs. If the batteries do not work properly, the wheelchair will not work properly.
		 Maintaining the batteries is vital to the performance of the wheelchair. Batteries last longer if they are never run completely flat. However, charging too frequently when the batteries have only been used a little will also decrease the batteries' life. For most wheelchairs, the ideal charging point is when the charge indicator is at 50%.
		Charge batteries every night and only with the charger provided with the wheelchair.
		 Make sure the battery charger is plugged in and working, and always keep it dry.
		• Batteries should be charged and maintained by a wheelchair maintenance expert. Contact one if your batteries aren't keeping a charge.
Monthly	Power seat functions (clean and lubricate)	• Power seat functions benefit people who can't move or reposition themselves effectively without help. These functions redistribute pressure, manage posture and tone, provide comfort, and help with personal care activities.
		 When inspecting these functions to make sure they work properly, first tilt, then recline, and finally elevate the legs. Take each power seat function to its full range. Clean all parts.
		• Do not remove the grease in the elevating seat mechanisms. Grease acts as a lubricant that helps the parts move and work as they should.
		• If the power seat malfunctions, the user may be left in an unsafe position for driving or at risk for pressure sores. Contact a wheelchair maintenance expert if you find problems such as grinding noises, jerking, or the seat functions not working consistently.
Monthly	Wiring and electronic connections	Wires and electrical connections must be intact for the wheelchair to work properly.
		• Check all electrical connections to ensure they're firmly in place and free of grime and corrosion. Connectors may loosen from bumps and vibrations. Cable ties can be used to secure loose wires. Before securing cable ties, ensure that they are safely away from moving parts and do not restrict the seat positioning.
		Clean corrosion from connectors. Corrosion can keep motors from driving and batteries from charging.
		 Make sure that all cables and wires are clean and intact.
		If you find any problems, contact a wheelchair maintenance expert.





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Also in the SCI Model Systems Consumer Information Series on Wheelchairs:

- Getting the Right Wheelchair: What the SCI Consumer Needs to Know
- The Power Wheelchair: What the SCI Consumer Needs to Know
- The Manual Wheelchair: What the SCI Consumer Needs to Know

Authorship

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Disclaimer: Do not try to fix or replace any wheelchair component if you don't feel comfortable doing it. Contact a wheelchair maintenance expert once a year to perform a complete wheelchair maintenance.

The content of this factsheet does not replace the advice of a medical professional. You should consult a health care provider about specific medical concerns or treatment. The content of this factsheet was developed under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90DP0012). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The content of this factsheet does not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.

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