USDA United States Department of Agriculture

Forest Service National Technology & Development Program

NTDP Tech Tips

New Helitorch Developed by the Forest Service

Shawn Steber, Project Leader

Highlights

- The National Technology and Development Program (NTDP) developed a new helitorch for interagency use.
- The helitorch uses a propane flame to ignite gelled fuel for aerial ignition operations.
- NTDP also developed fabrication drawings and an operations manual for the helitorch.

The U.S. Department of Agriculture, Forest Service, National Technology and Development Program (NTDP) designed, built, and successfully tested a new helitorch (figure 1). The National Interagency Aviation Committee (NIAC) approved the Forest Service Helitorch M-2015 for interagency use, and local fabrication shops can build the torch in accordance with the NIAC approval memorandum <https://www.nwcg.gov/committees/interagency-aerial-ignition-unit/resources>.

NTDP spent several years researching and developing the helitorch. The final design proved reliable during operational testing on several prescribed burns. The helitorch uses a propane flame (ignited by an electric spark) to ignite gelled fuel. Gelled fuel flows from the fuel drum through a fuel transfer pump, out the fuel discharge tip, and through the propane flame.

Figure 1—The National Technology and Development Program successfully flight testing the helitorch.

Helitorch Description

The helitorch uses a 55-gallon steel drum (UN 1A2) that meets U.S. Department of Transportation (DOT) specifications. A wheeled frame supports the drum (figure 2) and enables users to move the torch by hand. Four sight windows (two on the top of the drum and one on each end) provide a view of the fuel and help users to achieve the correct fill level. There is a two-way vapor valve on the top of the drum with a quick-connect cam and groove coupler. Users must remove the vapor valve and replace it with a vapor recovery hose when filling the drum. A dry-break fitting on the drum securely connects to a fuel transfer hose from a batch mixer or mix transfer system. Users can remove the head of the drum, making inspections and cleaning easier. A 24-volt fuel transfer pump draws the fuel from the drum and supplies it to the tip where ignition occurs.

A plunger at the fuel discharge tip (figure 3) prevents gelled fuel from discharging when the pump is off but allows gelled fuel to flow when the user activates the pump. The igniter tip is positioned so the gelled fuel drops through the propane flame and ignites. The igniter arm includes a flexible hose that allows users to raise and lock the arm in place for storage and transportation.

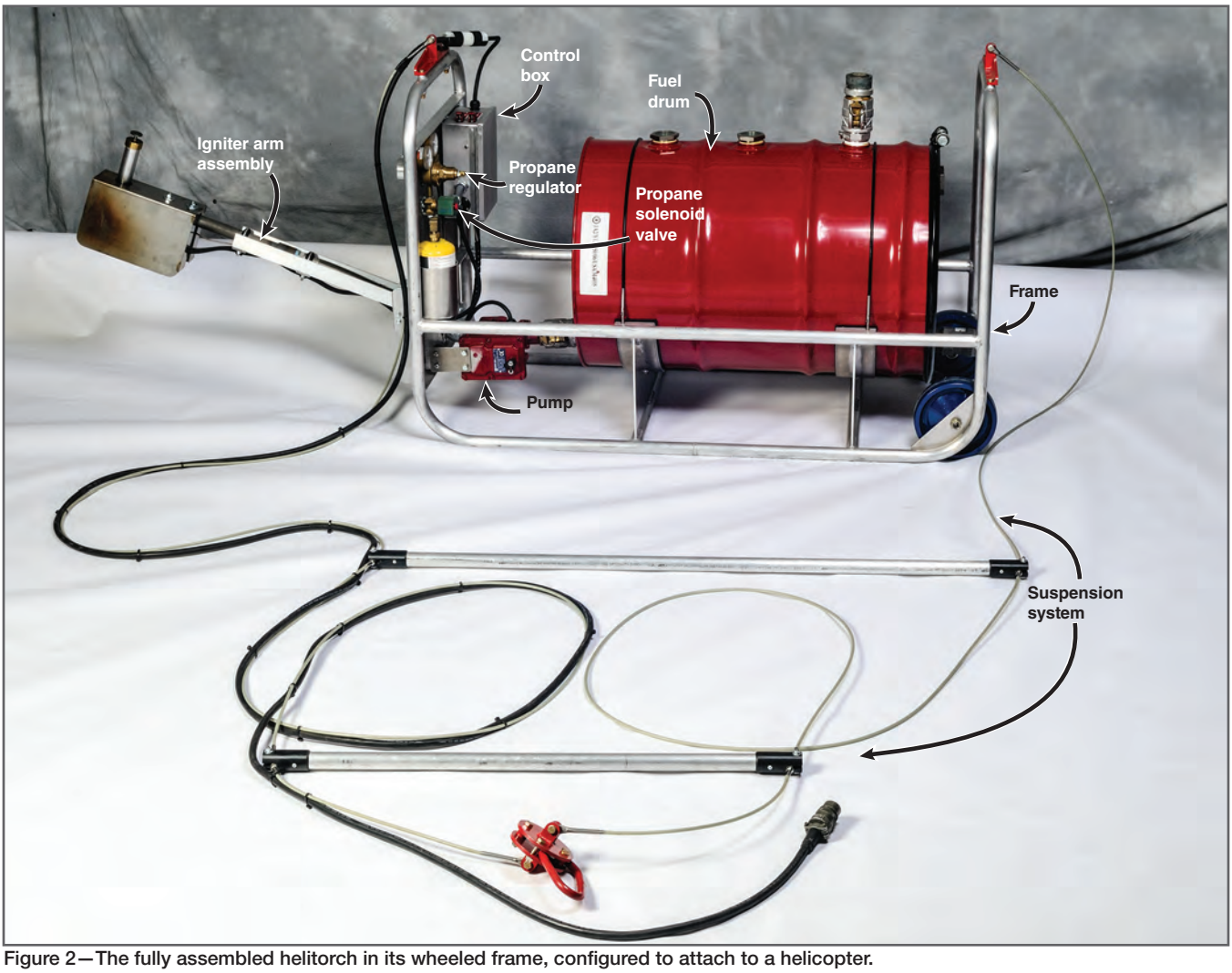

Figure 2—The fully assembled helitorch in its wheeled frame, configured to attach to a helicopter.

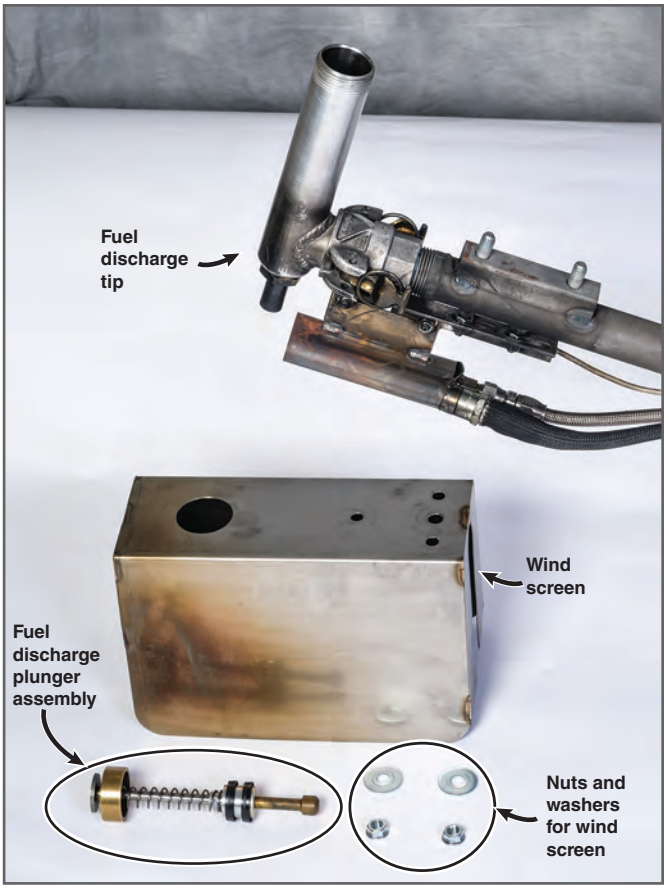

Figure 3—The end of the igniter arm with the windscreen removed and the fuel discharge tip disassembled. The ignition system attaches to the underside of the igniter arm. The fuel discharge plunger assembly is shown in the foreground.

The ignition sequence begins with both the spark and pump switches turned on and the torch connected electrically to the helicopter. The solenoid valve opens when the pilot switches the power on, allowing propane to flow to the igniter tip. Electricity simultaneously transfers to a spark plug at the igniter tip. The spark plug, positioned next to an orifice at the end of the propane supply hose, ignites the propane. The spark is continuous as long as the pilot supplies power. The gelled fuel ignites as it flows out the fuel discharge tip and through the propane flame. The ignited fuel then falls to the ground.

NTDP designed the new helitorch for simple and reliable operation. The control features (figure 4) are similar to other helitorches, allowing an easy transition from one helitorch model to another. Helitorch components are readily accessible for inspection, cleaning, repair, and replacement.

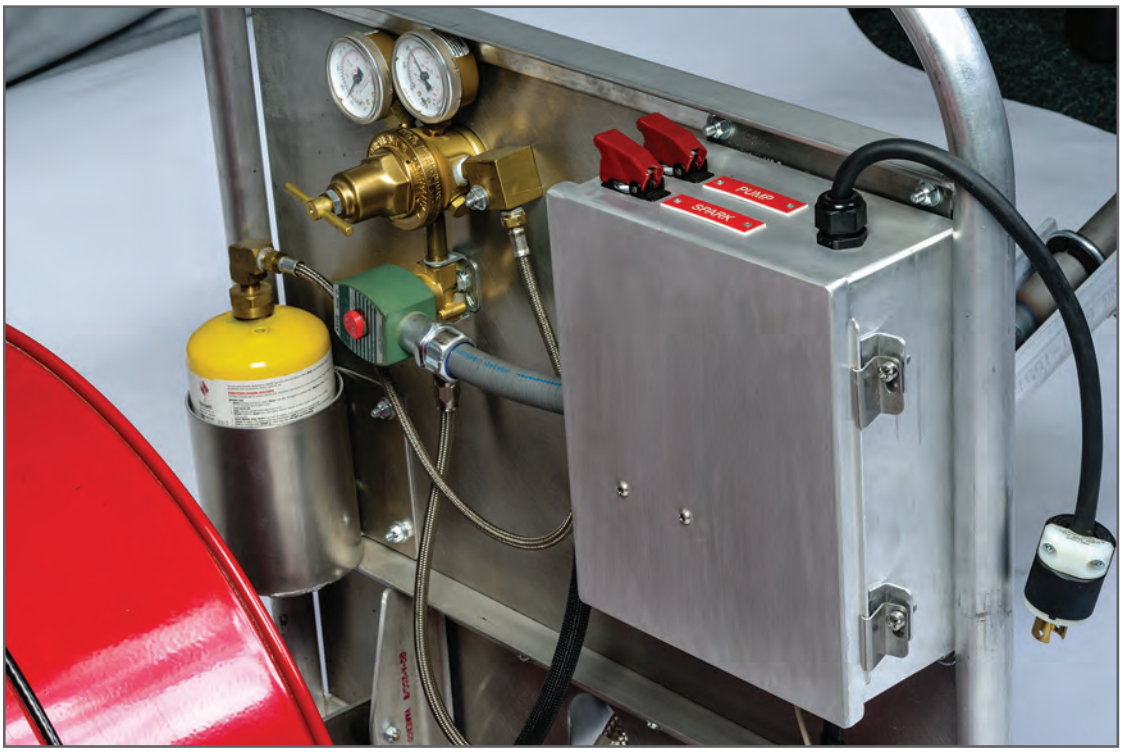

Figure 4—The control panel houses the propane regulator, the propane solenoid valve, the propane cylinder, and the control box with the pump and spark switches

Conclusion

The Forest Service Helitorch M-2015 is an option for aerial ignition operations. Refer to tables 1a and 1b for weight and length specifications. NTDP prepared fabrication drawings and an operations manual. The operations manual is available on the NTDP Aerial Ignition website <http://fsweb.mtdc.wo.fs.fed.us/vaerial_ign/> and the fabrication drawings are available from the NTDP ignition specialist. The drawings can be printed and taken to a local fabrication shop for construction. The Forest Service Helitorch M-2015 uses the suspension system detailed in NTDP drawing MTDC–1110.

Contact the NTDP ignition specialist at 406–329–3900 for technical support.

Table 1a—Helitorch weight specifications

Helitorch Specifications—Weight	
Component	Weight (pounds)
Torch—unfueled	172
Torch—fueled (55 gallons)	557
Suspension system	18
Torch, suspension, and fuel	575

Table 1b—Helitorch length specifications

Helitorch Specifications—Length	
Component	Length
Torch height	39 inches
Torch length	60 inches
Torch width	27 inches
Suspension length	22 feet
Suspended distance from cargo hook	25 feet

About the Author

Shawn Steber is a project leader at the U.S. Department of Agriculture, Forest Service, National Technology and Development Program (NTDP). In 2006, he received his bachelor's degree in general engineering with a mechanical engineering option from Montana Tech of the University of Montana. Before coming to NTDP in 2010, he worked for the U.S. Department of the Navy as a civilian nuclear engineer. Steber also has worked for the State of Montana as an engine boss and wildland firefighter.

About NTDP

The U.S. Department of Agriculture, Forest Service, National Technology and Development Program provides Forest Service employees and partners with practical, science-based solutions to resource management challenges. We evaluate, design, and develop new technologies, products, and systems to solve problems and deliver solutions.

Library Card

Steber, S. 2019. New helitorch developed by the Forest Service. 1951–2305P–NTDP. Tech. Tip. Missoula, MT; U.S. Department of Agriculture, Forest Service, National Technology and Development Program. 6 p.

The U.S. Department of Agriculture, Forest Service, National Technology and Development Program (NTDP) developed a new helitorch for firefighters. A combination of propane and an electric spark ignition ignite gelled fuel that flows from a 55-gallon fuel drum through a gasoline transfer pump and out a fuel discharge tip. The ignited fuel then falls to the ground. NTDP successfully flight-tested the helitorch during live prescribed burns. Fabrication drawings and an operations manual are now available.

Keywords: aerial ignition, fuel transportation, gelled fuel, prescribed burns, safety at work, U.S. Department of Transportation, DOT

Contact Information

Contact the National Technology and Development Program (NTDP) for additional technical information:

USDA Forest Service
National Technology and Development Program
Phone: 406–329–3978 or 909–599–1267
Email: wo_mtdc_pubs@fs.fed.us

Find electronic copies of NTDP documents on the internet at:

Search NTDP <http://www.fs.fed.us/eng/pubs>

Forest Service and Bureau of Land Management employees can search NTDP documents, CDs, DVDs, and videos on their internal computer networks at:

Search MTDC <http://fsweb.mtdc.wo.fs.fed.us/search/>
Search SDTDC <http://fsweb.sdtdc.wo.fs.fed.us/>

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