

**Canopy Lift Safety Guide**  
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**Approved by the Safety Committee of the Faculty of Forestry**  
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## **1 Introduction**

The purpose of this guide is to provide you with an overview of your responsibilities when conducting research with the canopy lift in Haliburton forest, and to ensure that all research is conducted in the safest possible manner. This guide is one of five that all students, staff and faculty members of the U of T must read before conducting research with the canopy lift:

- 1) U of T Occupational Health and Safety Guide for Supervisors  
<http://www.utoronto.ca/safety/supgdgr.htm>
- 2) U of T Guidelines for Safety in Field Research  
<http://www.utoronto.ca/safety/Policies/fieldres.htm>
- 3) Haliburton Safety Guide  
<http://www.forestry.utoronto.ca/safety.html>
- 4) Canopy Lift Safety Guide (this guide)  
<http://www.forestry.utoronto.ca/safety.html>
- 5) Operator's manual for the Scanlift SL240  
<http://www.forestry.utoronto.ca/safety.html>

## **2. Description of the canopy lift**

The canopy lift was purchased as part of CFI grant to members of the Faculty of Forestry to conduct research in the canopy of forests on the property of Haliburton Forest and Wildlife Reserve. In order to transport the lift between sites on the property, a float trailer and 4X4 pickup were also acquired as part of the CFI grant. When not in use the lift, truck and trailer will be stored in a secure garage at base camp in the Haliburton Forest.

The canopy lift that was purchased is a Scanlift 240 manufactured by Kesla of Finland. It is a mobile elevating work platform fitted with its own diesel engine. Due to its four wheel drive and four wheel steering capabilities, the canopy lift is very agile and can traverse rough terrain. The lift is equipped with two full sets of controls, one in the aerial basket, and one on the chassis. The lift is equipped with an electronically regulated hydraulic system which controls the boom and drives the wheels. The brakes of the lift automatically lock when the pressure of the driving motors has dropped. The lift is also equipped with an electrical emergency lowering system which can be controlled from the aerial basket or from the chassis. The boom extends to a maximum height of 24 m above the ground. The safe working weight limit for the aerial basket is 230 kg (507 lbs.). The basket is large enough for two

occupants, which is the maximum capacity irrespective of the occupants combined weights. The lift is stabilized by the presence of four hydraulically operated outriggers. For a full description of the canopy lift, please see obtain a copy of the operation manual from the Haliburton Safety Coordinator, Ian Kennedy.

### **3. General description of research participants and activities**

The operation of the canopy lift will be limited to professors, post-doctoral researchers, and graduate students. The Haliburton Safety Coordinator will be responsible for supervising the inspection, maintenance, and operation of the lift, as well as the training of personnel. In addition to the Haliburton Safety Coordinator, there will also be several lift operators who will be responsible for the daily operation of the lift, and several undergraduate assistants who will provide ground support to the lift operators. Both the lift operators and the ground assistants are required to complete a safety training program prior to the start of each field season (see section 4 for more details).

Current canopy research at Haliburton Forest focuses on the ecophysiology and structure of canopy trees. This research is being conducted by John Caspersen, Sean Thomas, and members of their labs. Below we provide a detailed description of the field methods and specific uses of the lift for this research. In the future, other faculty members may use the lift for other purposes that are not identified below. In general, one can expect that many of the same safety issues outlined in this document to apply. However, in the case that new methods are proposed that are not covered below, the principal investigator will be responsible for identifying any new safety concerns. These will then be reviewed by the Haliburton Safety Coordinator prior to the start of the field work, and the risk appropriately managed to ensure it does not pose an unacceptable level of risk.

### **4. Detailed description of research on the ecophysiology and structure of canopy trees.**

When conducting ecophysiological measurements within the forest canopy one is required to position the basket close to, or within, the canopy of an individual tree. Sampling is then performed by utilizing a portable gas exchange machine which measures the photosynthetic rates of the subject leaves. The researcher remains within the safety railing of the basket at all times as it is possible to pull a branch through the spacing in the railing.

Measurements of the structure of canopy trees will be performed by utilizing a fiberglass fishing outrigger from which a line will be lowered. Contacts of the line with canopy foliage are observed and recorded from both the basket and from personnel on the ground. Occasionally branch samples will be harvested from within the canopy, and these measurements will be taken on the ground.

## 5. Chain of responsibilities for safe operation of the canopy lift

**Haliburton Safety Coordinator:** The Haliburton Safety Coordinator will be responsible for supervising the inspection, maintenance, and operation of the lift, as well as the training of personnel. The Haliburton Safety Coordinator is responsible for: 1) ensuring that the lift is inspected annually and that the lift is properly maintained throughout the field season, 2) obtaining and maintaining certification as a lift safety trainer, 3) training all research personnel using the lift, including lift operators and ground assistants, 4) ensuring that each research team using the lift follows the procedures outlined in their Field Research Safety Planning Record and the Haliburton Safety Guide, 5) ensuring that each researcher has signed a lift safety form (see below), 5) ensuring that a copy of the operator's manual and the Lift Safety Guide are stored on the lift at all times, 6) ensuring that daily pre-start inspection forms and log sheets are filled out every day, 7) supervising keys to the canopy lift, and 8) ensuring the proper maintenance of the truck and trailer.

**Lift operator:** Lift operators will also be identified prior to each field season and will complete a safety training course given by the Haliburton Safety Coordinator for the safe operation of the canopy lift. Lift operators will be required to read all safety materials and the entire manual for the lift. The responsibilities of a lift operator include: operating within safety the limits of the canopy lift, ensuring that the daily pre-start inspection forms and log sheets are filled out every day, assisting with arranging for scheduled maintenance, supervising back-up keys to the canopy lift.

**Ground Assistants:** Ground assistants will perform a variety of tasks. For ecophysiological work, they may simply be needed to be on site as a safety backup for the lift operator. This would require them to be alert and to stay in radio contact with the lift operator. For the work involving canopy structure, the ground assistants will aid in the collection of data by utilizing binoculars to identify contacts between leaves and a line lowered from the basket. Additionally they may also collect data on branch samples which are lowered down to them. Ground assistants are not allowed to operate the canopy lift, and they will not assist with research in the aerial basket. On rare occasions which may be designated by the Haliburton Safety Coordinator, they may accompany the lift operator in the aerial basket, provided that there is another assistant who remains on the ground.

## 6. Safety procedures

In order to ensure that we have a safe and productive summer we have developed a set of safety procedures and corresponding checklists which will be utilized to ensure that safety procedures are adhered to. Each procedure is described below and accompanied by a checklist of safety items for that procedure. Before beginning any of these procedures, one must decide if the weather poses any risk. Wind loads on the basket and boom arm can pose a potential threat to the lifts stability. Additionally, do not use the lift if there is a potential for thunderstorms or lightning. While rain is not

an inherent danger, it is often accompanied by higher wind speeds and lightning. Finally, soil firmness can change drastically as soil moisture increases, threatening the stability of the lift.

## **6.1 Towing the Canopy lift**

Qualified personnel will operate the truck to tow the lift and trailer combination. This will be at the discretion of the Haliburton Safety Coordinator. The lift and trailer will be towed exclusively with the heavy duty 4X4 pick-up purchased as part of the canopy lift grant. The lift and trailer are within the safe towing capacity of the truck. Securing the lift with safety straps is an important element of safe towing

Transport of the lift in the short term will occur exclusively on the property of the Haliburton forest and Wildlife reserve. This will minimize risk due to the light traffic volumes for much of the season. However, if one is transporting the lift on weekends/civic holidays extra caution should be exercised as traffic on the property increases substantially. When possible, an additional vehicle will be used to drive ahead of the truck and identify potential hazards. Road condition should also be taken into consideration, and when possible the condition of the roads in the area where the lift will be transported will be inspected prior to departure.

Be aware of where you want to take the lift and ensure there is a place to turn the truck and trailer around. If no such location is available, then drive the lift to the desired location from a spot where the trailer and truck can safely be maneuvered (turned around and unloaded). Do not try to back the fully loaded trailer up steep hills. This results in jackknifing the trailer/truck and put considerable stress on the truck transmission and the trailer axles. It will also result in damage to the back of the truck (tailgate, rails and bumper).

### **Procedure**

1. Park truck and trailer combination with parking brake on. Ensure terrain is relatively level (< 5 degree incline).
2. Drive lift onto trailer
3. Secure all towing straps, and double check tightness
4. Depart

**6.2 Positioning the canopy lift at a field site:** Refer to Scanlift 240 manual for proper instructions on positioning the lift. The lift utilizes outriggers which result in a very stable base when deployed correctly. However, the lift should not be used in sites where the slope is greater than 7 degrees. Also, the lift should not be used within 30 meters of any standing dead tree. While the lift operator is positioning the lift, all other personnel should maintain a safe distance from the canopy lift (e.g. 10 m). While there will likely not be overhead electrical wires in the vicinity of the sites in Haliburton forest, contact (or proximity) of the jib boom with overhead wires is always a safety concern with mobile elevating devices and should be noted. Similarly, one should always be extra cautious of overhead dangers as the lift will often be positioned within and above the forest canopy. Contact with dead and live

branches poses a potential danger which can be minimized by carefully choosing the path of ascent. All personnel on the ground in the vicinity of the canopy lift and the operator in the basket shall be required to wear hard hats to minimize the risk of injury from falling debris. In the case that ground personnel observe a potential overhead danger while the boom is being raised they should either contact the operator on their radio to inform them of the hazard; or activate the emergency stop button located on the operating panel at the base of the lift, depending on the potential danger.

### **Procedure**

1. Ensure that the site is reasonably level ( $\leq 7$  degree incline).
2. All staff should maintain a distance of 10 m from the lift prior to deploying the outriggers
3. Deploy the outriggers
4. Position the wood stabilizing platforms under the feet of the outriggers
5. Further deploy the outriggers, adjust the outriggers until the leveling lights on the lift are all lit.

Please Note: soft ground is to be avoided, even when relatively level. Compression or shifting of foot of outrigger could compromise the stability of the lift. Make sure the legs will be clear from rocks, trees, roots etc. Make sure the jib won't be in a position where it could strike the bole of a tree.

**6.3 Mechanical Inspection for Defects:** Daily pre-start inspections and scheduled maintenance and safety check ups will significantly reduce the risk of a potential mechanical failure. In the event that a mechanical failure is detected, it should be reported to the Haliburton Safety Coordinator immediately. Use of the canopy lift will then be halted until the defective part/element is repaired.

The jib boom of the canopy lift is electro-hydraulically powered. In the event that power is lost (e.g. engine runs out of fuel) while the jib boom is extended, the Scanlift 240 is equipped with an emergency lowering system that is designed to allow for the safe lowering of the boom. This system is continuously ready to feed hydraulic oil in to the system if the main hydraulic pump becomes inoperable or the valves of the booms on the platform cannot be used for some reason. Please refer to manual p.35 for detailed instructions on the emergency lowering system.

### **Procedure**

1. Complete Daily pre-start inspection form located on a clip board in the lift storage compartment (Appendix B).
2. Sign off on the pre-start inspection checklist prior to use of the lift.

**6.4 Preparing for lift ascent:** Falling from the lift is a potential risk that is significantly minimized by the safety railing and the use of a safety climbing harness. This safety harness is attached to a short heavy duty safety line which is connected to the basket. In the event that personnel did fall out of the basket, the harness and safety line would prevent the individual from falling to the ground. The basket would then be lowered to the ground by the operator on the ground and first aid treatment administered if needed.

### **Procedure**

1. Prior to climbing into the aerial basket, put on a safety harness. Double check the tightness of the straps.
2. Check your payload to ensure you are within the weight safety limits of the lift.
3. Climb into the basket and inspect the condition of the safety line and the clip.
4. If the line is in good condition, connect the safety line to the harness and put on your hard hat.
5. Check that you have all the necessary equipment and your radio.
6. Check that the weather has not changed and is still suitable for canopy work.
7. You are now prepared to ascend into the canopy.

*Please Note:* If the basket is loaded beyond its weight capacity there is a danger of the lift becoming unbalanced and potentially unstable. It is especially important to note that the maximum safe operating load varies, depending on the geometry of the jib boom. Diagrams 5.1 and 5.2 from the Scanlift manual details the safe operating limits of the boom with various maximum loads. **These diagram's should be consulted prior to set up at a field location to determine if the sampling scheme is within the safe operating range of the machine.** These diagrams should be consulted to determine the cumulative maximum weight limit for personnel and equipment. Additionally, we will restrict the number of personnel in the basket to a maximum of two personnel at all times.

### *Implementation of the safety procedures, training, and maintenance of the Kesla Scanlift 240*

Lift operators will be required to fill out an activity log for work day and to complete the pre-start inspection form (see below). This will have the added benefit of being able to track in detail the number of hours of operation for maintenance purposes. The Haliburton Safety Coordinator will be responsible for periodically checking to see if proper procedures are being followed. The activity work log and the pre-start inspection forms will be kept in a binder in the canopy lifts storage compartment for easy access.

Yearly scheduled maintenance will be performed by a qualified mechanic, and will comply with the examination procedures outlined in detail in the Kesla Scanlift

240 manual. The Haliburton Safety Coordinator will be responsible for overseeing that the annual maintenance is completed and that suitable records are maintained.

All personnel in the vicinity of the canopy lift shall wear a hard hat to provide protection from falling debris. As mentioned previously, safety harnesses and ropes are required to be worn by personnel at all times when the lift is in position for boom extension. Two way radios are currently used in Haliburton to increase the level of safety in the field and will also be required when the lift is being used. This will allow for more effective communication between staff on the ground and in the basket. Additionally, staff will be on duty in the head office of the Haliburton Forest and Wildlife Reserve and in case of an emergency they can be contacted by radio and aid in contacting emergency medical assistance.

The Kesla Scanlift 240 has also been equipped with an electric winch that will be utilized if the machine is unable to negotiate the terrain under its own power. Lift Operators should be familiar with the safe operation of winch and the methodology for utilizing a tree saver.

### **Lift Safety Form for Lift operators**

- I have read the operator's manual for the Scanlift SL240
- I have read the Canopy Lift Safety Guide
- I have received safety training from the Haliburton Safety Coordinator
- I have agree to complete the pre-start inspection form prior to the daily operation of the canopy lift.
- I have studied diagrams 5.1 and 5.2 in the Scanlift manual and am familiar with the load limitations of the aerial basket.
- In the event of an emergency, I know how to operate the emergency boom controls on the ground operation panel.

Signature of Lift Operator: \_\_\_\_\_

Signature of Haliburton Safety Coordinator: \_\_\_\_\_

### **Lift Safety Form for Ground Assistants**

- I have read the Canopy Lift Safety Guide
- I have received safety training from the Haliburton Safety Coordinator
- In the event of an emergency, I know how to operate the emergency boom controls on the ground operation panel.

Signature of Ground Assistant: \_\_\_\_\_

Signature of Haliburton Safety Coordinator: \_\_\_\_\_

## Daily Pre-start Inspection Form

Date: \_\_\_\_\_

Lift Operator: \_\_\_\_\_

### **Itemized Inspection List**

#### **Check and add, if needed**

- Motor oil quantity
- Weather forecast is favorable
- Hydraulic oil quantity
- Diesel fuel quantity
- Check for hydraulic oil leakage
- Condition of hydraulic hoses and lines
- Tire pressure
- Visual circle check of the bolted joints, outriggers and supporting structures

#### **Test of the Safety Systems**

- Check of the function of the outrigger safety limits by trying to move the boom with the outriggers up. The boom should not move
- The outrigger safety limits only allow the boom to operate if they are in support position. Be aware that there is an override switch in the electric control box of the drive/outrigger valves
- The light indicators on the rear of the chassis are all lit when the lift is level
- Check of the safety limits of the lifting radius by horizontal boom extension (fig. 19.3.1 of the Scanlift Manual)
- Check of the vertical safe lifting radius (fig. 19.3.2 of the Scanlift manual)

Signature of Lift Operator: \_\_\_\_\_

Signature of Haliburton Safety Coordinator: \_\_\_\_\_



