Purpose

Prepared in Fall 2021 by Paul Brown (paulrbrown@gmail.com) as part of the Alpine Ice module in the Intermediate Alpine Climbing course for the Mountaineers.

Disclaimer

Climbing is dangerous, and nothing you read (including this) or learn is going to change that. Read the manuals. Climb within your limits. Know your limits by testing them. Test your limits in the gym and/or on top rope, not on route or on the sharp end.

TL;DR

A reasonable load out for an Intermediate student looking to climb alpine ice is as follows:

- One or two climbing tools with a reverse curve pick. (See this article on pick shapes and tradeoffs.)
- Five 17-19cm ice screws with one 21-23cm ice screw (on the expectation that the other partner brings the other half of the rack).
- Full-shank boots warm enough for the intended application.
- **Steel** 12-point automatic (best) or semi-automatic (often acceptable) crampons.

And then an assortment of additional gear (draws, cordage, rock pro, pickets, etc.) appropriate to the intended route.

Gear

Preamble

Alpine ice and water ice are different. Vertical and moderate angle ice are different. The same pitch will be different on different days and at different times. Different situations — a day of cragging in the bitter cold or a long alpine approach in the early Spring — will require different compromises. Your mileage **will** vary.

Crampons

- Rigid or semi-rigid crampons steel crampons are required. Most other qualities — fully-automatic versus semi-automatic, vertical front points versus horizontal, etc. — are somewhat negotiable.
    - The shape of horizontal front points makes them preferable in softer ice or hard snow.

    - The shape of vertical front points makes them preferable in harder ice and allows them to penetrate more deeply with less force.
    - Monopoints are useful when placing a crampon point into a small pocket of rock or drafting (reusing) on pick placements in delicate ice is necessary.
- Semi-automatic need to be *tight* at all times and can loosen up while climbing. Check them at belays or at regular intervals. *Losing a crampon or a loose crampon in consequential terrain is extremely dangerous.*
- Many vertical front point crampons have components that can be replaced, maintained (e.g., sharpened), adjusted, or reconfigured (e.g., switch to monopoint).
- Hinged crampons or crampons with a fabric or cord between the forefoot and heel should only be considered paired with the stiffest of boots, and even then may be too flexible for certain applications.
- The geometry of the toe of the boot, the primary front points, and secondary front points can be configured to suit the objective and your footwear (e.g., ski boots versus mountaineering boots).
    - Adjust the location of the toe of the boot using the different positions for the toe bail. Adjust the distance between the primary and secondary front points, if the crampon supports it.
    - Protruding front points can be a tripping hazard, especially when you're tired.
    - Test the compatibility of crampons and boots for proper fit prior to the outing or trip they will be used. Consider them as a system with unique qualities that have to be complementary or aligned.
- Do not sharpen the front side of your secondary front points, as this effectively moves them farther from the ice and makes it more difficult to fully engage.
- Carry the wrenches you need to adjust your crampons. Consider carrying an extra toe bail for fully automatic crampons.
- Microspikes are often useful as secondary traction for approaches that's quick to put on.
- A runner (girth-hitched around the bail) is helpful in changing-out or adjusting toe bails on fully-automatic crampons.
- The weight trade-offs of aluminum crampon components and flexible bars quickly escalate into a safety tradeoff for alpine ice and more committing mountaineering. (Many guides regard aluminum crampon components as unsuitable.)
    - Aluminum crampons will dull quickly on rock.
    - Aluminum points can bend or break under reasonable usage around rock and very hard ice.

Climbing Tools

- Climbing tools and picks can be either "T" rated or "B" rated.
    - "T" and "B" picks/tools can be mixed-and-matched.
    - "B" is for "Basic" and is generally suitable for… Basic climbing. In particular, *do not* stein-pull or torque on a "B" pick/tool.
    - "T" is for "Technical" and is suitable for ice and mixed climbing.
- Length and types of tools is subject to the trip conditions and type of ice anticipated.

- For alpine trips, consider tools that can serve multiple purposes or considerations. For example, a 65+cm T-rated axe taken on an alpine trip can serve as a mountain axe for snow/glacier travel, and the snow/glacier travel will likely dominate the total time on the trip.
- One tool should have a hammer.
    - An adze is either situational or preferential, as a pick can also be used to clear weak ice away from a placement, but an adze can be a convenience for trenching picket T-slot placements.
    - Exercise additional caution with an adze on steep ice in case a tool placement "blows".
- On alpine or multi-pitch routes, consider umbilicals for your tools in case they fall out of your possession. *Losing or compromising a source of traction — crampon or tool — is an immediate and potentially catastrophic risk.*
    - Terminology (leashes versus umbilicals) is sometimes confusing, depending on the manufacturer. Load-bearing, static leashes are used with older-style, straight-shaft climbing tools and allow you to hang from your wrist on the tool rather than grip the shaft. Elastic umbilicals are used with newer-style "leashless" climbing tools and prevent you from losing a tool if you drop it.
    - Most leashes and umbilicals are rated for body weight (if that) only (~2kN), meaning that you can hang from them but not fall on them.
    - Work out your screw placement, tool management (e.g., shouldering a tool and switching hands), and belay management workflows in advance to avoid tying things in a knot.
- Each tool style/manufacturer swings differently due to weight and composition, and you can alter the way a tool feels by adding or removing pick weights. Test the swing of your tools for comfort prior to any major outings.
- Keep tools sharp with picks protected until needed.
- Consider methods of tool stowage while on trips when tools are not immediately being used.
- Carry the wrenches that you need to adjust/tighten your tools (including pick weights, if you have them).
- Read the manuals for your tools to know which parts are strong enough for different applications, e.g., the spike on a Petzl Quark can be clipped as part of an anchor, but the spike on a Petzl Nomic should not be.

Ice Screws

- Bi-metalic screws are significantly lighter than all-steel screws (~80g for 19cm bi-metal, 160g for 19cm steel; for a rack of 6 screws, that's a pound!), but bi-metalic screws can bind in wet ice when the air is cold.
    - My personal preference is bi-metalic screws for alpine in the Cascades and steel for water ice.
    - Binding screws can be worked past, e.g., by backing off and re-trying, by using more force, or even using your climbing tool's pick in the hanger for leverage.

    - Weights:
        - Bi-metalic screws: Blue Ice (Aero Lite) 19cm 78g, Petzl (Laser Speed Light) 17cm 100g, Black Diamond (Ultralight) 19cm 89g.
        - Steel: Blue Ice (Aero) 19cm 100g, Petzl (Laser Speed) 17cm 143g, Black Diamond (Express) 19cm 159g.
- The correct length screw depends on what you'll be climbing and how you'll use it.
    - The strength of an ice screw placement comes from the quality of the ice and the ability of the threads to resist pulling force along the barrel of the screw. You always want the threads fully engaged in good quality ice, so choose screws that are a trade-off between reaching good ice, not bottoming out, and the time you'd spend cleaning a potential placement.
    - At least one longer (>20cm) screw is good for building v-threads/0-threads. You *can* rap off of a surprisingly thin column of ice (but why would you?).
    - A mixture of 17cm/19cm screws is ideal for typical moderate alpine ice. For good quality vertical water ice (which is the only kind you want to be climbing), shorter 15cm screws will provide a better tradeoff between strength of placement and time to place.
    - Even for different lengths of screws in the same material from the same manufacturer, the threaded portion of the barrel generally has the *same length*.
    - The most common exception to this rule are so-called 10cm "stubbies" or 7cm "ultrastubbies", which are special-purpose protection and do not meet the same standards for fall protection as 13cm and longer screws, as they have less thread on their shaft. *Always read the literature that accompanies your gear!*
    - Also, do not fall while ice climbing.
- The correct number of screws for your rack is the number that you need, when combined with your partner's screws, to build two anchors and place screws at reasonable spacing per pitch. For example:
    - If you're going to climb as a team of two on a 60m rope and place screws every 10m (5 screws) with three-screw anchors (2x3), you need 11 screws between you.
    - If you're going to climb as a team of two on a 30m rope and place screws every 5m (5 screws) with two-screw anchors (2x2), you need 9 screws between you.
    - Six screws is a good number (for each partner) for most Intermediate climbs.
- Each type of screw from each manufacturer has a different barrel diameter. The ascending order of barrel diameters is steel Petzl, steel Black Diamond, bi-metal Petzl, bi-metal Black Diamond, and then bi-metal Blue Ice.
    - You can re-use a screw placement with a screw of larger barrel diameter with no strength penalty.
- Each manufacturer has a slightly different hanger and crank setup, e.g., the Black Diamond hangers provide two separate places to clip in.
    - The crank handle for the Black Diamond "express" screws can get jammed with small rocks. It's annoying if you can't flip the handle out to crank the screw in, but it's dangerous if you can't stow the handle (e.g., the handle can open gates on draws when the screw rotates).

    - Consider the comfort of the placement mechanism for the screws you bring.
        - For example, if you will be on steeper ice you may be in a position where you will need to place the screw with only one hand. Sometimes after a difficult move with a marginal stance.
        - Practice placing screws with either hand.
- The teeth on ice screws are sharp, and the threads are delicate. Put screws away (ideally with both threads and teeth protected) as soon as you don't need them.
    - Magazine-style screw carriers allow you to leave caps at home.
    - Consider carrying a single screw separately on your harness or in your pack within easy reach for glacier travel. That one screw can help secure you and unweight the rope in the event of a crevasse fall.
- Some older Black Diamond screws have black hangers that heat up more quickly in the sun. Consider covering these with snow or checking placements more frequently.

V-Threaders and V-Thread Material

- A v-threader is secondary or rescue gear, and every climber should carry one.
- There are a variety of v-thread tools out there from home-made (coat hanger) to ridiculously ornate (Black Diamond First Shot).
- One favorite is the Grivel Candela; other people like the Camp Scorpio. The Candela is great in that it combines a cutter (e.g., to remove other people's leftover tat on a route), a hook, and can be used as a plunger to clear ice out of ice screw barrels.
- Making a v-thread/0-thread involves getting the bored holes to align and then getting the material or rope around the corner in the "v".
    - The right material for v-threads is strong enough for the purpose (e.g., 8mm nylon) and then both supple enough to make the bend and stiff enough to let you push it through.
    - You can use the hook on the v-threader to grab the material and pull it through, but you can often just coax it around the bend and then push it through.

Boots

- Rigid boots are an absolute requirement for ice climbing. Boots that are compatible with automatic crampons are one good assurance of proper rigidity.
    - Lighter boots that are only compatible with semi-automatic crampons (like La Sportiva Aequilibrium or Scarpa Ribelle families) are not suitable for general purpose ice climbing. To reiterate from above in the crampon section, *losing a crampon or a loose crampon in consequential terrain is extremely dangerous.*
- Ice climbing in ski boots is possible. Ski boots for general purpose travel on alpine ice can be a challenge due to the need for ankle articulation when traversing moderate angle slopes.
- Not all boots work well with all crampons, so ensure that the toe and heel bails are compatible with the boot. This is especially true if fitting crampons to ski boots without an alpine toe.

Gloves

- You need a glove that is warm enough to keep your hands from freezing, dextrous enough to manipulate ropes and gear, and isn't so thick that it effectively fattens up the grip of your climbing tool. Remember that you want to *hold* a climbing tool, not *squeeze* it. Squeezing requires effort and limits circulation, increasing fatigue and reducing warmth.
- Consider bringing multiple sets of gloves, to allow exchange of wet gloves for dry/ warm.