THE PAST, PRESENT AND FUTURE OF RATIONS

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Introduction

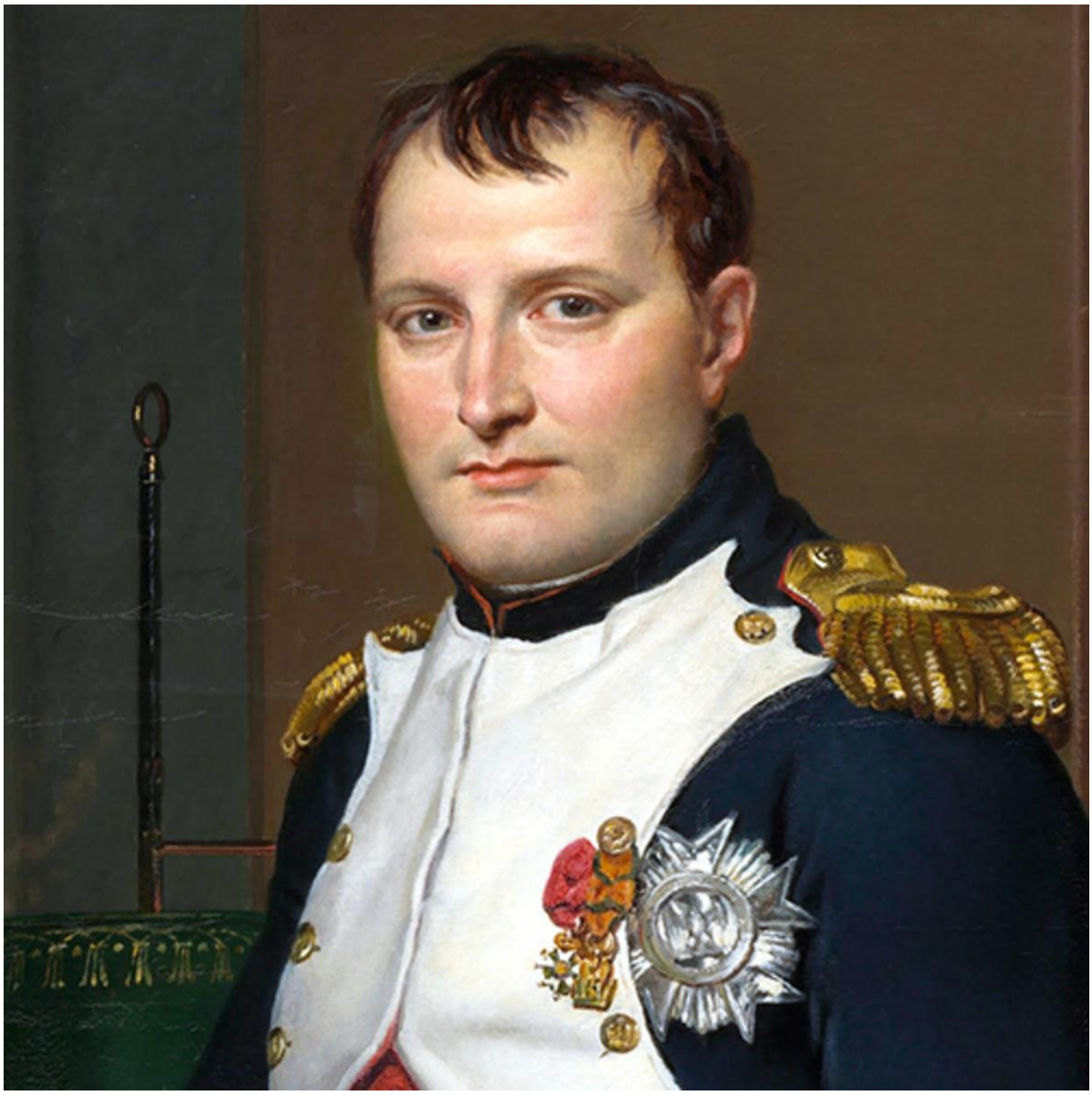
When deployed on operations, your existence boils down to doing your job, eating and sleeping. But the "ration pack" is a relatively new invention and for many armies through the ages they had to live off the land, forage or steal in order to survive. Regardless of the means, the goal has always been to put the most calories in the soldier's belly as quickly, efficiently and at the least cost possible.

These are the opening words of **a recent episode of the Unconventional Soldier podcast** I recorded with Colin Ferguson & Kevin O'Keefe, fellow STA veterans. We talked about one of the most important and least-discussed factors on the battlefield: the ration.

I am Ali Macdonald, Founder and CEO of Resilient Nutrition and a former British Army Reservist with a fascination about how to maximise human performance in tactical environments. I spend much of my day job designing inter-disciplinary programmes that deliver enhanced physical and cognitive performance through levers including sleep, physical training, psychological training, technical training and team effectiveness as well as nutrition. The rest of the time I develop food products and supplements that help athletes, explorers, everyday adventurers as well as the military and emergency services perform day in, day out whilst supporting their long term health.

But where did this whole rations thing come from?

A brief history of rations: from tin cans to MRE's



"An army marches on its stomach." Attributed to Napoleon and Frederick the Great.

The British Army and Navy, has always had a 'ration', as did the Romans. However, it wasn't a truly standard ration until tins and packets appeared. Before then the military ration was just a set of weights and measurements on paper which indicated how much of certain food types should be given to each soldier per day. What the troops actually got, especially whilst on campaign, varied with what they could get their hands on. But the 'ration' gave the Quartermaster something to aim for.

*George Washington's mess kit from the American Revolution. (Source: **Smithsonian**)*

In 1805, just before the arrival of the tin can – an important milestone in rations - the British Soldiers' daily ration consisted of - one and a half pounds of bread or flour (or one pound of ship's biscuits), one pound beef (or half that of pork), a quarter pint dried peas, one ounce cheese or butter, one ounce rice, and five pints 'small' beer - meaning weak beer (or one pint wine, or half a pint spirits, whichever was available locally). This ration had remained relatively unchanged for the preceding two hundred years of the British Army's existence and is even remarkably similar to what we know of the rations eaten by the Roman Legions nearly two thousand years before.

But in 1812, two Englishmen, named Donkin and Hall, purchased a patent 'for the preservation of food using a tinned iron canister' - the 'tin can'. At this moment not only did the future of army rations change but it was to have a profound effect on the course of history. If food could be preserved for longer it effectively meant that the soldier, or explorer, could now go further and for longer. Prior to canning, explorers had ventured into the unknown for hundreds of years loaded with barrels of salt beef, pork, and fish.

An early Emergency Ration can and hardtack biscuit (right)
(Source: https://www.bbc.com/news/magazine-21689069)

Whilst this process was effective, completely drying out the meat so that the microbes and bacteria that made the food go off could not do their thing, it also meant that your main staple of food was completely dried out and salty. If you are on a voyage of unknown length beyond the edge of your known world and your only source of food is salted meat, your menu is going to be a bit 'samey' and uninspiring. So, the concept of potentially canning any food was highly desirable both in terms of variety and nutritional value.

Donkin and Hall set up a commercial canning factory in Bermondsey, London and by 1813 were producing their first canned goods for the British Army and so was born the modern-day 'ration pack', relatively little changed in concept from what we know today. As some of you will be familiar, we were still opening tins of pâté as part of the British Army 24-hour rat pack nearly two hundred years later.

" If you are on a voyage of unknown length beyond the edge of your known world and your only source of food is salted meat, your menu is going to be a bit 'samey' and uninspiring."

Move forward to the time of the Boer War (1899-1902), and later the First World War, and we begin to see tins and packets of food appearing in soldier's rations but with the all-important, battle-winning, addition of tea aka caffeine. Also making an appearance at this time was the meal-in-a-tin idea. Not just a single food item, like Bully Beef, the pre-made meal, known as the "Meat and Veg Ration" was produced by a succession of commercial canneries from about 1900 to the Second World War. The most famous of these suppliers was the Maconochie company of Aberdeen, whose name was universally applied to the 'M&V Ration' during the First World War, whether supplied by them or not. The directions on the tin stated that "Contents may be eaten hot or cold", and that the

unopened tin should first be heated in boiling water for thirty minutes before opening and consuming. Starting to sound very familiar to you and me.

Soldiers eating rations in trench (Source: Daily Express)

By the time we get to the Second World War the British Army ration pack as a whole begins to look not too dissimilar to what a soldier has today. Additional items were added to keep the soldier going; namely matches and loo paper, alongside chocolate, biscuits (both sweet and plain), oatmeal, boiled sweets and tea, all of which still appeared in the soldier's ration pack when we were in training.

By the time of the Falklands War (1982) the British Tom was 'enjoying' a variety of tinned meals including steak and kidney pudding, chicken curry, casserole, or minced steak in the field. This ability to have different meals also meant that the soldier could now have different 'menus'. For the first time in three hundred years there was true variety by design rather than by what was locally available. The soldiers of the 'Cold War', when they weren't eating curry wurst in West Germany, had an array of goodies supplied to them for their 24-hours in the field and potentially a different menu every day. For example, Menu B in 1984 started with porridge, and bacon burger in a tin, and ended with apple and apricot flakes (dried).

Tinned rations 1980's (Source: Think Defence)

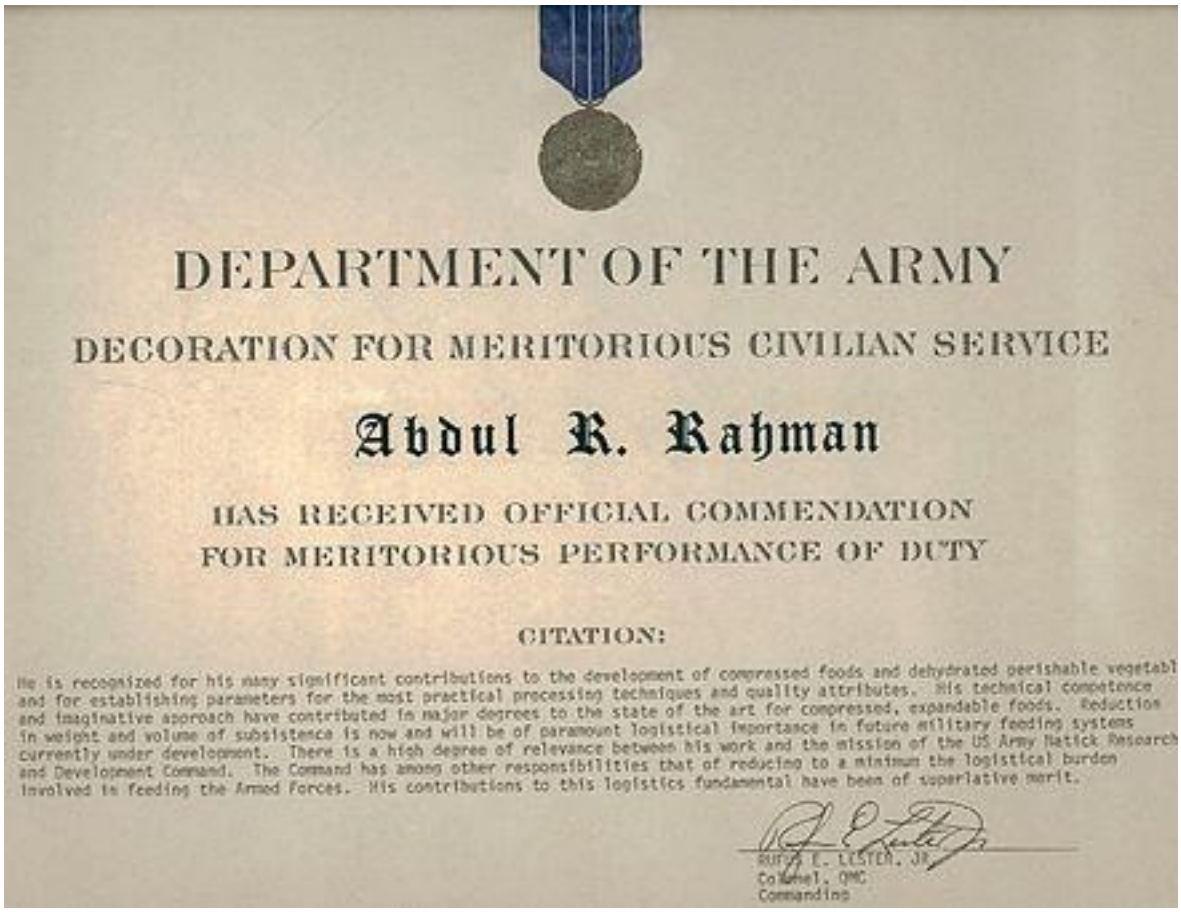
On top of the ‘main meals’ of spaghetti in a tomato sauce and steak and kidney pudding the squaddie enjoyed snacks. Snacks, indeed! Beef spread on biscuits, chocolate covered caramels, soup, tea OR coffee … OR hot chocolate! All interspersed with boiled sweets and chewing gum.

However, the true innovation in army rations occurred around 1995 with the evolution from tin to 'boil-in-the-bag'. Ever since the Romans, armies have looked for better ways to preserve, store, and transport food in order to support ever longer campaigns. Science now allowed the soldier to take almost any food into the field; enjoying ‘fresh’ tuna salads, lamb curries, pizza, and pasta anywhere they found themselves.

Army Ration Pack Ready To Eat Meals Menu 2 (Source: Vestey Foods via Amazon)

Whilst the entire development of rations has always involved the 'science' of the time - drying meat or canning for instance - it wasn't until relatively recently that the science of nutrition came to play an important part. Most people don't realize that this quest for better rations has over time contributed quite significantly to the food we know today in our own kitchens and lunch boxes. Mechanically retrieved and restructured meat (think SPAM), instant coffee and energy bars were all invented by the military and have now found their way into the civilian world as well as ways of manipulating yeasts and enzymes so that bread stays fresh for longer. That's why US army rations have burritos and pizza.

Whilst soldiers in the Second World War were provided with vitamin enriched chocolate bars and the ration pack of the 1980s introduced dextrose tablets in order to give soldier's an extra energy kick, keeping the soldier healthy and with the energy they need to keep going has been the focus for rations over the last twenty or so years.



DEPARTMENT OF THE ARMY

DECORATION FOR MERITORIOUS CIVILIAN SERVICE

Abdul R. Rahman

HAS RECEIVED OFFICIAL COMMENDATION
FOR MERITORIOUS PERFORMANCE OF DUTY

CITATION:

He is recognized for his many significant contributions to the development of compressed foods and dehydrated perishable vegetabl and for establishing parameters for the most practical processing techniques and quality attributes. His technical competence and imaginative approach have contributed in major degrees to the state of the art for compressed, expandable foods. Reduction in weight and volume of subsistence is now and will be of paramount logistical importance in future military feeding systems currently under development. There is a high degree of relevance between his work and the mission of the US Army Natick Research and Development Command. The Command has among other responsibilities that of reducing to a minimum the logistical burden involved in feeding the Armed Forces. His contributions to this logistics fundamental have been of superlative merit.

RUFUS E. LESTER, JR.
Colonel, QMC
Commanding

A citation from the U.S Dept. of the Army recognizing Dr. Abdul R. Rahman, credited with developing early prototypes of the MRE. (Source: U.S Department of Defense).

The experience of the British soldier in the field has come a long way over the last four hundred years. The one thing that has remained constant, and one of the greatest challenges, is the necessity of feeding an army in the field. This is because the capability of an Army in the field is as much determined by their morale, energy, and health as it is by the weapons that they carry. Having the right food, in the right quantities and of the right quality lies at the heart of success in conflict.

Many military commentators and experts will focus on weaponry, tanks, air-superiority, communications, or Smart Weapons, as the key to success on the battlefield. However, we believe at the heart of military success it is keeping the “meat in the middle” as well fed and effective as possible. And that means fast, effective nutrition in a familiar format that keeps mind, body and soul together.

The men who stare at goats

I've always been fascinated by endurance and resilience - what it takes to go that little bit further. In the mid 1990's I spent a lot of time on the hills, often carrying significant amounts of kit, so I was always looking for ways to lighten the load whilst remaining effective and flexible. I was quite comfortable being self sustained for long periods of time, but even then, I knew that to maximize performance over extended periods of time in the field, I would have to look beyond the basic calories in, calories out model.

We are the Pilgrims, master; we shall go, always a little further. It may be beyond that last blue mountain barred with snow, across that angry or that glimmering sea. James Elroy Flecker

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As long as armies have existed - soldiers, military leaders, logisticians and now a growing community of human performance experts have wrestled with the same questions:

- How can rations deliver more than just portable nutrition?
- How can diet stoke performance on the battlefield?
- How might we secure psychological victories against timeless enemies like fatigue, inattentiveness, and fear?

Historically, the answers to these questions have ranged from the illegal, to the immoral, to the unthinkable - imagine an unconstrained, design thinking-led excerpt from "**The men who stare at goats**"!

Downrange with the lotus eaters

We know that from the warriors of Homer's epics right through to the Russian assassins marauding around Ukraine, soldiers have not been shy when it comes to looking at ways to improve their performance on the battlefield.

18th-Century engraving depicts Odysseus pulling his men away from the lotus-eaters.

From hallucinogenic mushrooms and LSD to coca and cocaine; drugs have sustained warriors on the battlefield and have been used as weapons of warfare, either as non-lethal psychochemical weapons or as a means of subversion.

The expression “going berserk” originates from the mythic Norse Berserkers who would enter a trance-like (possibly drug-enduced) state before going into battle.

Meth and the Third Reich

As war became mechanized, there was a new and urgent need to enhance human performance to sustain operations at a new pace. All sides in WWII issued stimulants to keep their soldiers and aircrews awake, but no army embraced and researched performance-enhancing drugs as enthusiastically as the German *Wermacht*.

In *Blitzed: Drugs in the Third Reich*, Norman Ohler explains how the Nazis styled themselves as warriors against moral degeneracy, yet the entire Third Reich was permeated with drugs: cocaine, heroin, and morphine. But their overwhelming drug of choice was methamphetamine, or crystal meth, used by everyone from factory workers to housewives, and soldiers who took it to “fight through.” Meth has been partly credited for the rapid German victory in the “Blitz” of 1940.

But what comes up must come down.

Hitler's dealer, Dr. Theodore Morel

It turns out optimizing human performance is about understanding and nurturing our human needs, not popping a pill to shut them out for a few hours so we can "fight through."

"Mothers Little Helper"

The use of stimulants in the military didn't end with the defeat of Nazism. Similar compounds to those that stoked the Blitzkrieg would gain popularity as diet pills and ADHD medication popular in post-war America.

*Image: **The Simpsons** drug cabinet. Source: The Mary Sue. **Electronic Sports League Will Implement Randomized Drug Tests For Player***

Some of these drugs have since found their way back to war.

As recently as the Gulf War and the Global War On Terror, American and French forces have prescribed Modafinil (a prescription drug to treat narcolepsy) to keep special forces operators and pilots awake.

Modafinil has been described as the nearest thing there is to a real real-life limitless pill. Unlike stimulants such as Ritalin and Adderall, it seems to have less impact on sleep quality at night. However, it's illegal to take Modafinil without a prescription in many jurisdictions and its use in the military has prompted controversy and questions about side effects.

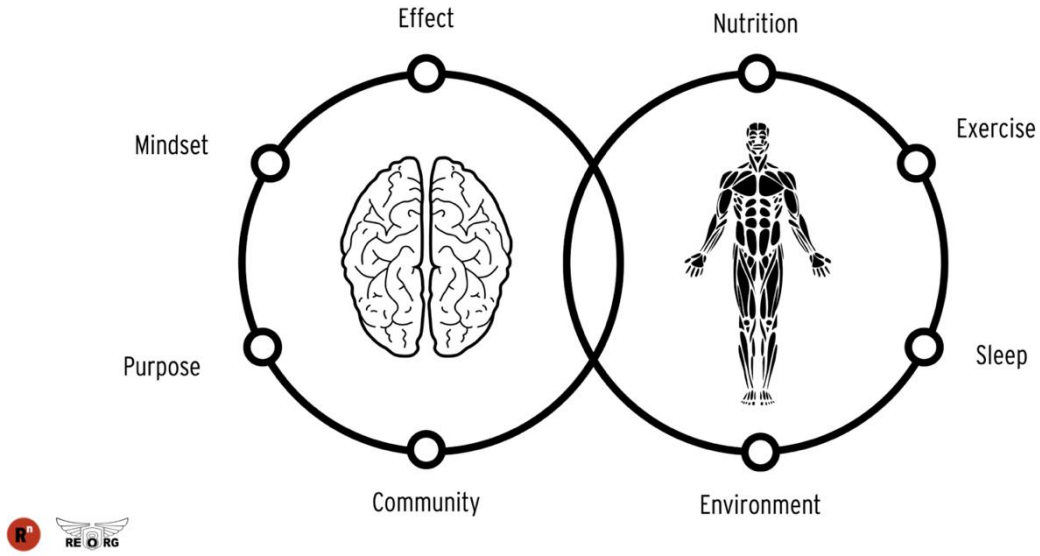
Meanwhile, caffeine remains a safe, reliable stimulant, popular with soldiers for centuries.

The future of human performance is about more than enabling all-nighters

It should come as no surprise that ancient warlords and Nazi-henchmen weren't interested in unlocking human potential in their search for compounds to fuel conquest. But even the recent use of stimulants by democratic armies doesn't reveal the full picture on true range of factors that need to be considered if you want to maximise the effect of your army.

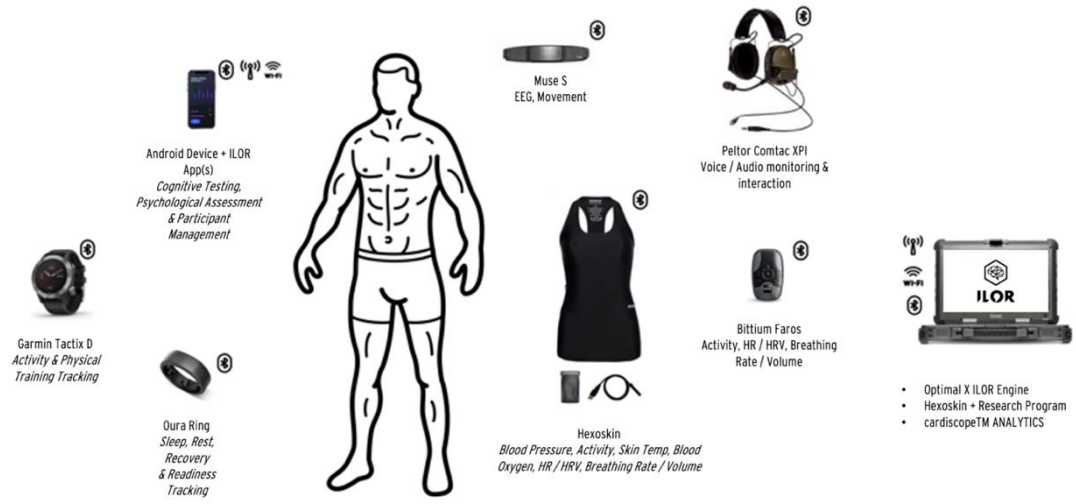
In 2013, we set up Optimal Human Performance (OHP) based on a set of protocols and interventions to help individuals and teams maximize their resilience across 8 dimensions:

8 DIMENSIONS OF OPERATOR PERFORMANCE



Subsequently, we got to work with a range of wearables, particularly looking at physiological data like Heart Rate Variability (HRV) and psychological factors like Learning Agility (essentially our ability to learn, adapt, unlearn, and relearn to keep up with constantly changing conditions) as well as cognitive readiness using tools like the NASA Task Load Index (TLX), a subjective, multidimensional assessment tool that rates perceived **workload** in order to assess a task, system or team's effectiveness.

INTELLIGENT LOAD OPTIMISATION & RECOVERY ENGINE



We developed a prototype platform for the Army Warfighting Experiment called Intelligent Load Optimisation and Recovery (ILOR) engine which enabled us to measure “total load” by analyzing heart rate, brainwave and psychological data in real-time. In parallel, we identified different

strategies including nutritional strategies that would enable people to be more resilient to increasing levels of load.

Every time we dug into it, it was clear that by optimising cognitive performance we could almost inevitably sustain higher levels of physical performance for longer - the two were inseparable. And by keeping the **Mind** in the game longer, we could keep the **Body** and **Spirit** in the game too.

Further, faster, smarter.

This capability, along with a willingness by a few forward thinking teams and organisations, has allowed us to design, develop and test a range of interventions to improve operator performance and it was this work that has enabled us to completely redesign the field nutrition systems to deliver improved operator performance, with up to 50% reduction in weight, significant reduction in waste and enhanced functional fit to a wider range of operational environments.

Stealing Fire

"Prometheus stole fire from the gods. We are each the heirs of that divine spark. Used wisely the spark fuel's ones journey and lights the way. Treated carelessly, the spark consumes the owner and everything in its path."

The 21st century has seen tremendous advances in military hardware, from protective equipment and communications to lighter, more modular rifles, now referred to as “weapons systems” for their versatility and multifunctionality.

The art of war has been increasingly delegated to high-speed, special operations units made up of operators who are as much athletes as they are soldiers. We equip these units with the best gear and training, so why not the best food? In the area of tactical nutrition, the last great innovation was the self-heating MRE. And that was an improvement in packaging and preparation, not in nutritional content.

Based on our experience at Resilient Nutrition, and in light of the release of the Operational Ration Pack tender from the UK’s Ministry of Defence, we believe there is major room for improvement. It is our belief that an operational “nutrition system” should not only deliver sufficient energy, but critically enhance cognitive and physical performance, around the clock, across a range of operational environments whilst also supporting long term health.

Photo credit: LPhot Dan Rosenbaum

Lesons from the edge

Some important **advancements in ration technology** came from the austere, physically taxing conditions of polar exploration – journeys that might not have been possible without food preservation and packaging. Over a century later, in a world with no more blank spots on the map, the explorers of today chart the human terrain within themselves as they take on feats like ocean rowing and ultramarathon running. As these extraordinary performers redefine the limits of human endurance, we've made it our mission to fuel their endeavours and glean lessons that can help us develop the nutrition systems of the future.

In 2019 we trialled the essence of such a system with a pair of athletes who wanted to break the world record for rowing across the Atlantic. *(Video Credit: James May, Dustoff Films)*

Essentially, we designed an "optimised" nutrition system for maximizing physical and cognitive performance in readiness for weeks of pretty much continuous activity. These guys were looking down the barrel of 40-50 days of continuous shifts on the oars, day and night, fighting their way across the North Atlantic. For an insight into what they were up against, emotionally and physically, hear it direct from **Chris Williams, Max Thorpe** and **Dave Spelman**.

We had to come up with a solution that not only delivered 6,000+ calories per day but more importantly, minimised the impact of the damage the guys were doing to themselves, as well as maintaining their ability to make clear decisions when they were absolutely exhausted.

Understanding Chrononutrition

As we discussed in **our last post**, the centuries-old struggle to maintain alertness on the battlefield has historically led to the use of drugs like amphetamines that allow a soldier to "fight through" sleep and exhaustion – at least while under the influence. Recent sleep and nutrition science has exposed the harm of such a strategy and the value of working with the body's natural sleep rhythm rather than trying to blot it out.

One of our specific areas of research is chrononutrition, essentially the science of what and when you eat relative to the time of day, the dark light cycle and your movement through time zones.

So, we used that knowledge to prescribe different foods and formats to match what they needed and could digest at different times of day. Higher carbs in the morning and higher protein in the evening, more liquids and pastes during the night than solids, hot food and drinks when body temperature is at its lowest (around 4am) and so on.

Max & Dave went on to break the world record with a time of 35 days, 7 hours and 54 minutes (beating the previous world record by 11 minutes after a grueling 21-hour final push on the oars).

Photo Credit: Atlantic Campaigns

Fit for the future

So, what will the rations systems of tomorrow look like?

Personalised: rations systems are going to be more personalised based on factors such as gender, age, weight, dietary preference, allergies etc and in time cater for individual biology.

Functional: rations need to be ergogenic (performance enhancing), adaptogenic (stress reducing) and nootropic (cognition enhancing).

Integrated: the US Navy has already trialled nutrition systems built into clothing and kit. We have focused on designing packs that are compatible in terms of dimensions with load carriage systems, minimise bulk and weight and fit alongside all the other kit and equipment the modern operator is carrying.

Visual & tactile: the will use visual language and iconography to make it easy to know what, how and when to take certain items in all environments, especially at night.

Theatre specific: nutritional and functional requirements are heavily dependent on operational environment - hot wet, hot dry, extreme cold, altitude etc. Adapting nutrition strategies to operational environments positively impacts mission outcome.

Adaptable & configurable: rations systems are going to much more adaptable and controllable in terms of what gets delivered to units and to individuals - with shorter cycles between demand and supply and much more modularity.

Sustainable: this is a real issue and not just because we have a critical and non-negotiable need to protect the planet. We have to build sustainability into the whole system - local sourcing of raw materials, supply chains designed to optimise energy consumption, packaging materials that maintain the long shelf life but also be biodegradable, reducing the number of items in the pack, making more items multipurpose or reusable, increasing the use of refillables both in camp and in the field.

Lighter and more modular: with a shift to using **drones** and **autonomous vehicles** there are huge opportunities to shift more stuff around the battlespace on a more just in time basis but it has to be light and easy to pack in formats that work with existing conventions and systems. A lot of our focus at the moment is on that operational integration.

Education and training: troops are more informed (although generally the quality of **nutrition advice available to the public is poor**). So, training and education is actually a massive part of the required change. You can already see this in the US with a big focus on streaming soldiers into nutrition channels based on profile, but we are also doing things over here - the Royal Marines are leading the way with Op Endurance and all Tier 1 units have active Human Performance programmes covering multiple dimensions like purpose, mindset, team, effect, environment and sleep as well as exercise and nutrition.

Optimising Human Performance

They say that war and conflict often accelerate innovation and it certainly seems like that at the moment. In the last year we have responded to multiple urgent operational requirements from disaster response, to medical to military organisations responding to the war in Ukraine. I hope we have proven that change is possible; that it doesn't need to take decades; that an interdisciplinary, human centric design approach coupled with rapid prototyping and trials with front line units and SME's working alongside defence primes can deliver impact and value at speed.

In a defence and security industry obsessed by information and technology, that introduces even more volatility, uncertainty, complexity and ambiguity for the modern operator to deal with, improving rations to keep the human being in the middle as effective as possible should be on the menu.