FLIGHT COMMENT

EDITION 3 1978

THE FLIGHT SAFETY DIGEST OF THE CANADIAN ARMED FORCES

FLIGHT LINE ENVIRONMENTAL AND PROTECTIVE CLOTHING

by Capt C.R. Payne and Ms D. Carrick

This article obviously contains a message for Flight Safety Officers. Have you had your annual meeting with your Supply Officer about winter flying clothing? If not, you may still have time, but not much!!

Editor

This article is intended to acquaint all and sundry air techs with the environmental and protective clothing currently available and to introduce items which will soon be coming off production. In general it is aimed at the officers and technicians who are responsible for the maintenance of Canadian Forces (CF) aircraft. In round numbers there are 11,000 aircraft maintainers in the CF of which 3,000 are continually exposed to the elements in the performance of first line maintenance, another 7,000 are employed in hangars and shops performing second line maintenance, and the remaining 1000 are employed at various third line maintenance facilities and in Headquarters staff functions.

Regardless of where a maintainer is now employed there is a good chance that within the next four years he will be directly involved in, or be responsible for the effective operation of, first line maintenance functions. When this occurs, one of his prime concerns will be the availability of adequate environmental or protective clothing and accessory items so that the job at hand can be completed safely. The availability of adequate and sufficient quantities of clothing has a great impact on morale, operational effectiveness and above all flight safety. A cold or uncomfortable technician does not have his mind fully on the job at hand and his physiological state may well contribute to an accident. It behoves personnel at all supervisory levels to ensure that their technicians are well clothed, protected and visible when working on the flight line, in the hangars, and in the shops.

A recent survey of ten units across Canada revealed that the majority of first line maintenance technicians spend some 20 to 35 minutes on the flight line before returning inside a

All the items shown here are currently available through Scale B13-035. Shown are the parka, balaclava, sun and snow goggles, leather work gloves with woollen liner, windpants, and shearling lined boots. ◀ The addition of reflective tape to the parka and windpants is done at unit level, if desired. Any combination of thermal underwear, work dress uniform, and coveralls form the "layer system" under the parka and windpants.

The fluorescent red and white reflective tape of the marshallers vest offer the high visibility required for both day and night flight line activities. A combination of bump cap and ear defenders are now available for added protection when required.

The experimental coverall, complete with reflective tape, hood, and front zipper closure. It was tested with a one-piece insulated underwear, and will be included in the coverall review.

hangar to either complete paperwork or repair unserviceable aircraft. In addition, the technicians are in and out of the hangar between 7 and 15 times during a shift depending on the tasks they are performing. With these statistics in mind it follows that the best way to stay comfortable when the indoor temperature is 15°C to 20°C and the outdoor temperature may fluctuate to a low of –40°C (without considering a wind chill factor) is to wear a few layers of clothing.

This "layer principle" is the basic principle used in the development of a workable all-temperature clothing system. In this, several items of clothing are worn one over the other, each an insulator in itself, and each trapping "dead air" beneath it to guard against heat escaping from the body thus providing additional warmth.

Canadian Forces Scale B13-035 authorizes issue of environmental and protective clothing to personnel in static units and is the primary scale that applies to AERE officers and the ground crew of the MOC 500 series trades. At present, aircraft technicians have four modes of dress which, in combination, will form a "layer system" of clothing that should suffice throughout the year and during any inclement weather. The dress consists of thermal underwear, work dress uniform, coveralls, wet weather jacket and trousers, or parka and windpants. For the extremities there are wool socks, safety boots, and shearling lined flight boots, leather work gloves with wool liners, balaclava, toque, or winter cap with ear flaps. Many of these items are shown in accompanying photographs and are available now through Scale B13-035.

Three new items – a cold weather boot, a LOX handlers suit and a wet weather suit will replace existing items when

cont'd on page 4

The new intermediate jacket which is now being procured features slash pockets with a velcro fastening flap, storm cuffs and reflective tape for high visibility. The cold weather boot is designed to be worn over a safety boot and is much lighter and more comfortable than the shearling lined flight boot now available.

To replace the present LOX Handlers suit this outfit of lightweight neoprene and includes an attached hood and integral suspenders for the trousers. Reflective tape is put on the garment during manufacture. ▶

Quite a variety of environmental clothing and not all of it on Scale B13-035. In contrast, the other photos depict a neater appearance for flight line technicians. The problem of shrinking white coveralls, in fact the suitability of the white coverall, is now under study.

present stocks are exhausted. The long awaited intermediate jacket is now being procured and will be a welcome addition to the technicians' environmental clothing scale. The new jacket will afford protection during the Spring and Fall periods when it is not cold enough to warrant the wearing of a parka, and will be held and issued in the same manner as the parka. These new items are also illustrated in the accompanying photographs. Again, Scale B13-035 will reflect your entitlement.

The lack of an intermediate weight jacket has for years been a very noticeable weakness in the clothing system. In its absence, technicians have made a habit of scrounging, whenever possible, the aircrew intermediate jacket. This was understandable; however, it should be realized that all CF clothing is designed for specific functions, and is not equally suitable for all purposes. For instance, some clothing is intended to fit the body snugly, therefore other clothing which is designed to fit loosely is not suitable for the same job. Some clothing has finishes on it which help to repel water or oil, while other items which look much the same may have no such treatment. Some clothing is made from fabric which is woven in such a way as to reduce snagging and tearing, but this same cloth has other deficiencies which can cause problems if used in the wrong milieu.

Work is constantly underway to improve the clothing available to the MOC 500 tradesman, but this process is one which does take time. An example of this work is the cold weather coverall, with liner, which has been on trial this past winter at several bases. Reports are not all in yet, at time of writing, however indications are that the trial system has both good and bad characteristics. From these results, the next step is to take a close look at all coveralls used by the flight line, including the test garment, in order to provide the best coverall, or coverall system possible. This will include such things as an examination of pockets, fit, fabric construction, openings, and may well involve further trials. This means that some time may pass before changes are visible through the supply system, but rest assured that we are constantly working toward your better protection and comfort.

Meanwhile, in the interest of flight safety and personnel comfort review your environmental and protective clothing requirements and ensure that there are adequate stocks on hand to satisfy your needs. Don't wait for Winter, do it now. Remember that Scale B13-035 is the primary clothing scale for aircraft maintainers, however, there are other environmental or protective clothing scales that apply to specialized jobs so check with your Supply Section for your needs.

New improved rainwear is made of a heavier material than that now in use and is seam free over the shoulder area. Procurement of this item has been initiated and it will replace the present rainwear as stocks are exhausted.

About the Authors

Not unfamiliar with a flight line Capt Roy Payne joined the RCAF in 1954 and served as an airframe technician before receiving his commission from the ranks in 1969 at Camp Borden where he was instructing basic students in aircraft cross servicing techniques. A recent graduate sociologist he spent three years in Toronto with the Technical Services Agency then returned to the sharp end at CFB North Bay where he was a maintenance officer concerned with the serviceability of the venerable CF100 (Clunk) and CT133 aircraft of 414 (EW) Squadron. At present he is deeply involved with environmental and protective clothing for the MOC 500 series technician and the implementation of the Tool Control System (TCS) in the CF. Maybe the next article from Roy will be a serious look at implementation of the TCS in the CF over the past five years — that is, after he looks at the environmental clothing problems of technicians serving with 116 Air Transport Unit in Ismalia where he will be residing for the next six months.

Dawn Carrick was graduated from the University of Toronto with a BSc in Textile Science. She is now working as a Project Officer with the Directorate of Clothing, General Engineering and Maintenance (DCGEM), with primary areas of interest being combat, work, and environmental protective clothing for land, sea, and air elements.

from the Director

I recently heard a young Air Cadet warrant officer discussing flight safety. He said that three things are required for safe flight: airspeed, altitude and common sense. Of the three, only the last one is a human factor. Although he was talking mainly about flying fixed wing aircraft, the idea is applicable to any aspect of our flight safety program. So often, the simple application of common sense is all that is needed to prevent a hazardous situation from developing and causing an accident. I would suggest that if what you are doing is sensible, it's probably safe as well.

The young sage referred to is WO Douglas Patton from 84 "ASTRA" SQN, Thunder Bay. The occasion was the annual meeting of the Air Cadet League of Canada, held in Ottawa in June '78.

Editor

AIRSHOW ACCIDENT

On the evening of 3 May 1978, the Snowbirds (431 Demonstration Squadron) were performing a scheduled display at Grande Prairie, Alberta. During one of the solos' passes – level opposing triple rolls at 300 feet AGL and 300 KIAS – the lead solo aircraft began to break-up after the first roll. The aircraft crashed into a ploughed field approximately 5 seconds later. The pilot ejected approximately 1 second before impact but was fatally injured.

Investigation revealed that structural failure occurred in the horizontal stabilizer rear attachment fitting, resulting in loss of the horizontal stabilizer, with subsequent loss of the starboard main wing due to the ensuing high negative "G" wing loading. Cause of the failure was established as a fatigue crack.

OBESITY – its ups and downs

by Maj John Bardsley, M.D., Ph.D. Flight Surgeon DPM

The incidence of obesity in Canadian society has been estimated variously between one-third and two-thirds of the population. The same figures apply to the United States, where at any given time, approximately 10-20 million Americans are on a diet of some kind, and spend $10 million per year on diet related expenses. Startling isn't it? But consider that the state of being overweight is associated with a decreased life span and increased chances of developing a wide variety of illnesses and it's shocking. Little wonder, then, that obesity has drawn so much attention. What follows is an attempt to deal with various aspects of obesity from an educational point of view in order to foster a general understanding of this complex state, and to make you aware of some of the modern thinking on this age old problem. It is not intended to be a panacea for obese people. Let's start with the basics of energy dynamics in the body.

How Our Body Gets Its Energy

The essentials for life support come from the food we eat. Basically, there are three types of energy-releasing foodstuffs – carbohydrates, fats and proteins. However, alcohol comprises such a large portion of the daily caloric intake in most Western societies (e.g. an average of 5% in Britain and 8% in France) that this carbohydrate will be considered an entity on its own. These four substances are broken down by the digestive system into basic substances which are used either as building blocks for tissue growth and repair (a process called anabolism) or further broken down to release energy (catabolism). The amount of energy released varies: carbohydrates (from such foods as potatoes, macaroni and spaghetti) produce four calories per gram: fats, nine; proteins (principally from meats), five; and alcohol, seven. However, most foods are a combination of three of these constituents, and Table I will give you the calorie value of some foods commonly found in average diets. Since our Western diet comprises big meals high in carbohydrates, fats and alcohol, we tend to over-consume calories, the excess being converted to storage products.

The body's storage products consist of carbohydrates (e.g. glycogen, used for short term, high energy – consuming activities) and fats (e.g. triglycerides, used for long term, low energy-consuming activities). Fat is by far the largest energy storage form in the body. The average person has enough stored fat to meet the needs of two months of total starvation. Moreover, in contrast to the carbohydrate stores, it does not seem to have any inherent mechanisms to restrict its size. Therefore, the greater the excess in our diets, the fatter we become. Now let's look at how our energy is used.

How Our Body Uses Energy

Basically, there are four uses of energy, in the animal body: for basal metabolism, growth and repair, specific dynamic action and activity. Basal metabolism, or basal metabolic rate (BMR) is the rate at which energy is consumed by the body at rest; in other words, the energy needed for vital functions. The BMR is variable, and depends on the quantity of active tissue in the organism (basically the mass of the body minus the weight of fat, water and bone minerals), age (it decreases with age, the male losing more than the female), sex (males are 8% higher than females), physical condition (athletes are 6% less than average), and state of obesity (since obese people have more living tissue in the form of fat cells their BMR tends to be higher than normal). BMR accounts for a relatively small consumption of energy in the body.

Growth is an energy consumer of large proportion during childhood, but becomes relatively less so after growth is arrested after puberty. The energy for repair is used for the replacement of tissues with high turnover – for example, the blood, skin and lining of the gut – and the healings of injured tissues – for example burns and lacerations. Other than in childhood, this category is normally of minor importance in the energy economy of the body.

Specific dynamic action (SDA) is the energy required for the utilization of foodstuffs, and only consumes about 6% of the dietary caloric intake. The SDA varies from food to food, and forms the basis of recommendations made by dieticians for the consumption of foods that are filling and also require a lot of energy to digest.

Finally, by far the largest consumer of energy, and the most variable, is activity over and above the other three. When we speak of such activity, what we are really speaking of is muscular activity, for, although mental activity does require energy, it is so little – three hours of intense mental concentration consumes only ten calories – it is hardly worth considering. Muscular activity on the other hand can burn an enormous amount of fuel, a lot of the energy thereby produced being given off as heat. The more strenuous the activity is, the more energy needed, and, therefore, consumed, as can be seen in Table II. As we will see later, some researchers feel that the technology of our society has reduced this portion of our energy output to such an extent, that it becomes a principle cause of obesity. Certainly the fact that the average caloric intake in our society has decreased since 1900 while the extent of obesity has increased lends credence to this hypothesis.

TABLE II

The energy consumed by five typical activities, based on an "average" 150 pound person. Heavier people will consume more calories because they have to move more weight. For example, a 200 pound person uses at least one-third more energy in each activity (after Konishi, 1965).

Activity	*Calorie Consumption Per Minute*
Resting (reclined)	1.3 calories per minute
Walking (3.5 mph)	5.2 calories per minute
Bicycling	8.2 calories per minute
Swimming	11.2 calories per minute
Running (jogging)	19.4 calories per minute

Now let's look at input and output. Since obesity is basically a result of energy excess, it is obvious that such excess must be avoided. To do this one must cut down the input, step up the output, or a combination of the two. If we look at Table I, we can see that by stopping adding a tablespoon of sugar to coffee, we can save 50 calories of input. On the other hand, if we look at that 50 calories, in terms of Table II, we can see that it would take about ten minutes of walking to

TABLE I

Approximate number of calories contained in some foods commonly found in Western diets. Where not indicated, servings are moderate or medium in size.

Foodstuffs	*Calories*
Apple, 1 large	100
Asparagus, 1 stalk	3
Bacon, 1 strip	50
Bacon fat, 1 tbs	100
Banana, small	90
Beans, 1 cup	30
Beer, one bottle	180
Beets, one	50
Bologna, 1 slice	100
Bread, 1 slice (most types)	70-80
Brownie, 1 square	140
Butter, 1 tbs	95
Cabbage, raw, 1 cup	25
Cake, 1 slice (med.)	360
Carrot, raw	25
Celery, 1 stalk	8
Cheese, cream, 1 tbs	50
Cheese, cottage, 1 tbs	20
Cheese, cheddar, 1 oz	110
Chicken, Fried, 1/2 breast	230
Chocolate bar, small	350
Cookie, Chocolate chip	50
Cream, coffee, 1 tbs	60
Cream, whipped, 1 tbs	35
Cucumber, 1/2 medium	10
Cupcake	250
Doughnut, plain	150
Dressing, French, 1 tbs	60
Dressing, Mayonnaise, 1 tbs	90
Egg, fried	110
Egg, Boiled	75
Fish, Halibut, 1/2 lb	205
Fish, Cod	100
Grapefruit, 1/2	50
Ham, 1 slice	265
Honey, 1 tbs	100
Ice Cream, 1/6 qt	200
Ice Cream soda	325
Ice milk, 1/2 qt	145
Jam, 1 tbs	100
Jello, 1/2 cup	85
Lamb, 1 slice	100
Lard, 1 tbs	100
Lettuce, 2 large leaves	5
Liquor, 1-1/2 oz, Gin	120
Liquor, 1-1/2 oz, Rum	150
Liquor, 1-1/2 oz, Whisky	150
Macaroni, cooked, 3/4 cup	100
Margarine, 1 tbs	100
Marshmallow, 1	20
Milk, whole, 1 glass	165
Milk, skim, 1 glass	80
Milk, chocolate	1,100
Milk Shake, plain	240
Milk Shake, malted	500
Mushroom, 1	1
Orange, 1	70
Orange juice, 1 cup	120
Oils, 1 tbs	110
Peach, med	50
Pear, med	50
Peas, 1/2 cup	85
Pie, apple, 1/6	380
Pie, raisin	440
Pizza, cheese	180
Pork and beans, 1/2 cup	175
Pork chop	315
Potato, baked	90
Potato, mashed, 1/2 cup	100
Potato, salad, 1/2 cup	100
Potato chip, 1	10
Radish, 1	2
Raisins, 1/4 cup	90
Rice, cooked, 3/4 cup	100
Roll, med	100
Sandwich, Club	590
Sandwich, Hamburger	300
Sandwich, Hot beef	430
Sandwich, Tuna fish salad	280
Sherbit, 1/6 qt	180
Shrimp, fried	180
Soft Drinks, 10 oz, Cola	125
Soft Drink, 10 oz, Ginger Ale	110
Soup, 1 can, mushroom	360
Soup, 1 can, noodle	290
Soup, 1 can, tomato	230
Soup, 1 can, vegetable	200
Spinach, cooked, 1/2 cup	20
Steak, sirloin	250
Steak, T-bone	235
Strawberry Shortcake	400
Sugar, 1 tbs, brown	50
Sugar, 1 tbs, white	50
Sugar, 1 tbs, icing	40
Syrup, chocolate, 1/4 cup	200
Syrup, corn, 1 tbs	75
Syrup, Maple, 1 tbs	70
Syrup, molasses, 1 tbs	70
Tomato, med	30
Tomato juice, 1 cup	60
Turkey	100
Waffle	250
Wiener	125
Wines, champagne, 4 oz	120
Wines, table (red or white), 4 oz	95
Wines, port, 1 oz	50
Wines, sherry, 1 oz	40

burn it off. Alternatively, we could cut our sugar in half and walk for five minutes. Thus, if the caloric value of a specific food is known (from Table I or a similar table) and the energy expenditure required by certain activities is also known (Table II), then any combination of input and output can be calculated in order to strike a balance, or add or lose weight. Such a balance becomes important indeed as we age. The four energy consumers mentioned above decrease in thier needs as we grow older. The overall result is a 21% reduction in energy needs between the ages of 22 and 75, a reduction not usually balanced by corresponding decrease in energy intake. The result is an increased incidence of obesity in older people.

The Control of Fat Tissue

Fat tissue is a dynamic organ with a constant and fairly rapid turnover, while at the same time usually remaining fairly constant in total amount. Fat is laid down as fat deposits in two ways. The most important quantitatively is the uptake of blood fats and their conversion into triglyceride stores by fat cells. This process depends on glucose since one of the constituents of triglycerides (alpha glycerophosophate) is derived from the sugar. The second method is the direct conversion by the fat cells of the glucose derived from dietary carbohydrates into triglycerides, the so-called *de novo* pathway. The first of these two pathways is enhanced principally by high fat intake. The second principally by high carbohydrate intake, and both are regulated by insulin which favours fat storage.

When dietary calories become deficient, the process is reversed and the stored triglycerides are broken down into free fatty acids and glycerol which are used for fuel. This process, opposed by insulin (and thereby by the consumption of carbohydrates, which stimulate insulin secretion) is promoted by a variety of catabolic hormones from the adrenal glands (adrenaline, noradrenaline), the pituitary gland (ACTH, LH, TSH, prolactin) and the pancreas (glucagon, secretin).

Let's pause briefly and summarize while we catch our breath. What we have seen until now is a chain of events whereby the food presented to the body is broken down and used either for building up tissue, or for energy release. Such energy is used for vital bodily functions, the most demanding of which is muscular activity. Any excess food is converted to stored energy, principally in the form of fat, or adipose tissue, which seems almost limitless in its potential size. In times of caloric deprivation, fat tissue can be used to meet the body's energy needs. All in all, then, obesity is really an external manifestation of an energy imbalance which results from too much energy input, too little output, or a combination of both. All this seems quite simple enough, and it is, but it belies the complexity of the obese state, as manifested by the causes.

The Causes of Obesity

The causes of obesity remain enigmatic. Although there is no doubt that it is basically a result of energy imbalance – that is, the energy put into the body is more than the body needs for vital functions and activity – the underlying reasons for the obese state are unclear.

At the cellular level there are three types of obesity. Firstly, there is obesity found in people who have a greater-than-normal number of fat cells in their body; secondly, those who have fat cells larger than normal size; and thirdly, obesity associated with adipose tissue which has not only a greater number of fat cells, but these cells are larger than normal as well. When the fat cells are larger than normal, the reason at least seems apparent – they are merely storing as fat the excess energy presented to the body; however, the situation with a greater-than-normal number of fat cells is rather more complex. Recent studies have indicated that the number of fat cells is determined both in the uterus and during childhood (up to 5-13 years of age) and depends, at least in part, on the amount of food presented to the body during these periods. Experiments in rats have indicated that this tendency for fat cells to reproduce is genetically determined, both in rate of division, and the length of time during which such division can take place. The latter allows certain strains of rats to increase the number of fat cells well into adult life. Moreover, there is evidence that fat cells have to be of a minimum size, and, if they are below such a size, they can "instruct" the brain to eat more. Thus, these rats become fat primarily through an internal disorder. If such a phenomenon is operative in humans, one can easily understand how difficult it would be for such a fat person to maintain a lower weight, since the desire to be thin and, therefore, eat less would be in constant conflict with an internal drive to eat more.

Considering heredity a little further, studies on identical twins that have been separated after birth have shown that such twins display similar tendencies to obesity in spite of the environment of their upbringing. Moreover, in families where obesity is prevalent, the children born of the parents who are obese show much greater degrees of obesity than their adopted siblings. These results indicate that there is more in operation than merely the dietary environment and alimentary behaviour afforded by the family environment.

Although hormonal imbalances play a relatively miniscule role in the causation of obesity, they claim a large popularity, probably due in part to the search for "excuses" for being overweight. This category includes inherited entities as well as those secondary to trauma to, and tumors of, the endocrine organs. It is interesting to note that investigations into hormonal causes of obesity indicate that the hormonal abnormalities observed are more commonly the result of, rather than cause of, most obese states. Such abnormalities include high serum insulin levels (and tissue insensitivity to insulin) decreased serum growth hormone levels and increased corticosteroid production and excretion. Studies on people who were made obese and subsequently lost weight have shown that these hormonal abnormalities occurred with obesity and subsequently return to normal with the return to "normal" weight. These secondary hormonal changes in obese people may help to explain in part why it is that when thin people overeat their heat production goes up by 25-50% (a phenomenon potentiated by exercise) an effect much less pronounced in the obese.

From the psychological view point there has emerged a theory that 95-97% of the cases of obesity are a result of inappropriate eating behaviour; that is, the majority of obese people are obese because they are overeating in response to external cues, rather than internal ones. This theory is based on studies which have shown that obese people consumed food in response to such things as boredom, loneliness, anxiety, or because of the time or situation. In other words, these people do not eat in response to hunger, but rather eat as a behavioural response to situations in their lives. Some people seem to think thin (and become so) when they feel good about things, and think fat (and become so) when they feel bad. Within the psychological sphere one could also consider the effects of personality and culture on such eating habits and food preferences. Consider also that some people become and stay fat because that is the way they see themselves, or because it fulfills some inner need. And dare we even hint that obesity may be an addiction?

Some people believe that their continuous urge to eat is caused by an inherent abnormality in the centres controlling hunger and/or satiety. There is no evidence that these two centres, located in that portion of the brain called the hypothalamus, are directly responsible for such abnormal eating behaviour; however, what has been put forward is that sedentary lifestyles result in the malfunctioning of the appetite control centre in such a way that food intake is not controlled. In contrast, in people who are active, appetite is more controlled so that food intake is more closely geared to energy output. What this means is that when the human body is inactive, the mechanisms controlling food intake become defective enabling overeating. Such a mechanism may explain part of the tendency to obesity in our society, but it is not the sole one.

It is quite safe to say that most North Americans overeat, or at least overconsume calories, what with our meat-centered diet high in fats, our "coffee breaks" of sugared beverages, our snack-oriented recreational habits and our reliance on beverage alcohol as a focus of our social activities – all reinforced by the constant bombardment with seductive advertising. The stage is thereby set for energy imbalance. Given such a situation, then even though studies have shown that some obese people consume only a small number of calories more than non-obese people, such a small difference could make a significant contribution over many years. The same sort of phenomenon is applicable to the other side of the energy balance coin, but in the opposite fashion. Twentieth century technology has enabled, and indeed, encouraged sedentariness. The result is a relative lack of energy expenditure. Moreover, observations on obese people indicate that they are less active than their non-obese peers, both in the type of things they do, and the way they do them. Have you ever watched thin people? They are usually vertiable perpetual motion – legs jiggling, arms going, up and down; while the obese person sits still or moves only slowly. The result of all this, then, is a person who consumes a few (or many) more calories than he uses each day over the long term who becomes, and stays, fat.

Measuring the Body's Fat Content

The measurement of obesity is every bit as complicated as its causes. Although the most accurate method is the Archimedian technique which we learned in high school, this method is hardly practicable from any point of view. The traditional height/weight charts, supposedly giving "ideal", "desirable" or "relative" weights are fraught with error. To begin with, most of these charts are based on insurance company actuarial data and, therefore, tend to be biased. Use of these charts is often dependent on correct interpretation of frame size, again a haphazard undertaking. These tables also tend to understate the "ideal" weights from a health viewpoint, since people who are 5-10 pounds lighter than their "ideal" on the average have increased longevity. Finally, they tend to miss the gain in muscle mass accompanying increased physical activity and make it look as if fat mass has not been lost when indeed it has been.

Another method, again fraught with problems, is that of using indexes such as the ponderal index. The presently favoured of such methods seems to be the body mass index which is weight/height^2; however, the index system is so new, and is generating so much controversy, that it is, for the moment, not practicable.

The most reliable and practicable method presently available appears to be the measurement of skin fold thicknesses. This method entails the taking of a fold of skin between the fingers, and measuring its thickness with a special set of calipers. As one might imagine, there are several "serious" problems with this method. Firstly, it samples only subcutaneous fat and we all know that fat deposits occur all over the body. Secondly, it is sex specific – we are all acutely aware of the not-so-subtle variations on male and female fat distributions. And there are other drawbacks: results vary from examiner to examiner, and even with one examiner from one time to the next; there is debate over which sites to measure; it is also age and population specific; and the equipment is expensive. In spite of all these drawbacks, it seems to be the best available. Three sites are generally favoured for measuring skin fold thicknesses – the back of the upper arm (triceps); on the back below the shoulder blade (subscapular); and on the side above the hip (suprailiac). To attain greater accuracy an average of two or three such measurements can be taken.

No matter what method of weight determination is used, it is quite obvious that clinical judgement must play a significant role, and reliance must be placed on the patient's own opinion, since the average person knows whether he is carrying excess weight, and how that weight affects him. Now let's look at how obesity does affect the carrier.

Effects on Health

There is no question that obesity is bad for health, both physically and psychologically, but it may not be as bad as what it commonly believed. The decrease in longevity amongst the obese seems to be well enough established to be a fact; however, because the data for it is from selected populations (e.g. policy holders with insurance companies) it should be interpreted with that in mind. The correlation of stroke and degenerative joint disease (osteoarthritis) with obesity also seems firm, as does that for high blood pressure (hypertension); however, the latter tends to be over-estimated since normal sized blood pressure cuffs are routinely used, and the combination of this cuff with a fat arm over-estimates the blood pressure considerably (by as much as 8-12 mm Hg).

The effects of obesity on hardening of the arteries and heart disease deserve some comments. Obesity *per se* is *not* associated with increased incidences of such disorders; however, what it is associated with is an increased incidence of risk factors for heart diseases such as elevated serum triglycerides and cholesterol, diabetes mellitus (or decreased glucose tolerance) and possibly decreased physical activity. In other words, cardiovascular disease is a complication of the mechanisms that produce, or are commonly produced by, obesity, rather than the obesity itself. Moreover, the commonly held misconception that obesity contributes to heart disease because it overloads the heart, or puts a strain on it, is grossly untrue, and should be disspelled once and for all. In fact, the load on the heart may indeed be beneficial.

In summary, then, although there is little doubt that obesity, especially gross obesity, is deleterious, its effects on health tend to be greatly over-estimated and over-stated, the latter probably doing more harm to health than good through its psychological effect. Perhaps we would be a lot further ahead controlling the risk factors which accompany the obese state rather than try to reverse the obesity itself. This may be quite reasonable considering that some psychologists estimate that the chances of successful, permanent weight loss in chronic obesity are as low as 28:1. And it must be remembered that obesity is an individual phenomenon, affecting each person in a different fashion, and constant attention should, therefore, be focussed on the effects on that individual, rather than assume that all obesity is bad. Indeed, on balance, it may not be!

Therapy

Given such dismal statistics and the complexity of the state of obesity, one almost shudders at the prospects of what can be done to alleviate the condition. To say that obesity is a difficult disorder to treat is historically an understatement; however, that is can be treated successfully is a fact, and a common-sensible approach seems worthwhile.

In discussing the therapy of obesity, let's start by looking at certain radical forms of treatment. Firstly, the drug therapy of obesity (except for certain hormonal disorders) is not only fraught with real danger, such as addiction and other unwanted side effects, but is virtually useless. Secondly, ileal bypass surgery is a procedure recommended only for so-called "morbid" or gross obesity. This procedure is fraught with serious side effects over and above the risk of surgery, and although there is initial weight loss, the patient tends to plateau at obese levels after about one or two years. Finally, there is the whole realm of fad and crash diets and fasting. Fasting is unnecessary since it has no more effect on weight loss than a 700-800 calorie diet and harmful side effects are possible. Crash diets are also inadvisable because of severe caloric restriction, and the fact that such restrictions affect work performance adversely. Fad diets are a waste of time, and usually get the dieter's expectations high and then let them down, furthering any psychological disorders the patient may have, and aggravating his condition further. Moreover, such diets are designed for the short term, and losing weight and keeping it off must be a life-long venture in which the "loser" must readjust his lifestyle, especially in his attitudes and practices concerning both food and activity. Let's have a look at programmes which offer such long-term features.

Successful therapies seem almost uniformly multidisciplinary. A balanced, low calorie diet is obviously essential, but successful programmes have also shown the need for strong behavioural modification and educational components, as well as an increased physical activity schedule. The necessity for these four areas which encompass the fields of nutrition, health education, psychology and physical education, becomes obvious when one considers the major causal factors discussed above. Such a regimen appears to obviate medical participation, but it should not, since, although these four disciplines are the mainstay of therapy, there is still that minority of cases where medical problems are primary. Therefore, medical screening is essential. In addition, adequate medical follow-up to guard against deleterious side effects of the programme seems reasonable.

Let's take a few moments and talk about three of the key areas of this multidisciplinary treatment regimen. A balanced diet, low in animal fat and containing fewer calories than are required by the individual for his energy needs, is essential. Such a diet should contain a variety of foods each day from the four main food groups (i.e. milk products, breads and cereals, meats and alternates, and fruits and vegetables). Caloric restriction should be kept modest, and geared to a weekly weight loss of about one to two pounds. Greater restrictions can have undesirable side effects. For instance, work performance decreases as dietary calories decrease — 1,000 calories reduced from a 3,600 calorie daily requirement cuts work performance by over 50 per cent. It seems reasonable that the diet should restrict salt as well. Not only is it a well accepted fact that most North American diets contain too much salt, thereby contributing to high blood pressure, but some workers maintain salt-restriction as a necessary ingredient to satisfactory weight loss. The resultant loss of water which is retained in the body by our excess salt, is the reason for the immediate large weight loss (5-10 lbs) that accompanies a lot of diets (and causes subsequent disappointment when such a rate is not maintained).

Physical activity is another key area in an effective weight losing programme. The nature of the activity is extremely important since the type of internal stores used depends on the type of muscular activity. The state of inactivity is the time when the body stores fat, so obviously less time should be spent here. Whereas maximum energy activities, such as sprinting, consume mainly carbohydrate stores, low energy activities, such as walking, jogging and cycling, consume mainly fat stores, with intermediate levels consuming some of both storage products. Therefore, one can appreciate that the low activity exercises are the best for weight loss, not only because they consume principally fats, but also because these are the exercises which usually demand the lowest levels of physical fitness and are the easiest to perform. These are important considerations when one considers that most obese people will probably be just starting out on any kind of exercise regimen. As well as the exertional level, the time of exertion is important — exercise must be for at least two minutes and preferably for 20 or more at a time. Finally, as in any exercise programme, the exercises should be tailored to meet the special needs, likes, and state of fitness and health of the exerciser, and should be graded to effect gradual introduction of more demanding types.

Many people believe that exercising while dieting is bad because it increases the appetite. This is not true for the average person. Exercising for less than two hours per day either leaves the appetite normal, or actually decreases it, a phenomenon noticed by many sedentary people who commence exercising. Moreover, as we have seen previously, sedentariness seems to be the culprit in leading to increased food intake. If we refer back to Table II, we realize that obese people are actually at an advantage in the consumption of energy through exercise, due to the increased weight that they must move around. However, even at the average energy-consumption levels, if a person kept his food intake constant while adding merely 30 minutes of cycling or 45 minutes of walking each day, he would lose about 26 pounds over one year. (based on one pound of fat being burned off with 7½ hours of bicycling, 5½ hours of swimming or 11-1/6 hours of walking). Albeit that this means not only just a 2 pound loss per month, but revamping one's lifestyle, both requiring patience, the latter "virtue" is really the name of the game when it comes to permanent weight loss.

The educational component is a vital part of the overall programme. This component can not only inform the person of what they are doing and why, but can also dispel myths, and put expections for weight loss into perspective. The weight loser must be made fully aware of the stimuli that lead him to his eating behaviour, and urged to change such behaviour, or avoid such situations, by substituting different, more healthful endeavours.

Overall, such a multidisciplinary approach strives for a restricted caloric intake while concomitantly ensuring balanced nutrition, increased caloric output in terms of healthful and appropriate physical activity, education in all related areas so dieters understand what they are doing and why, careful medical monitoring and, probably most importantly, substituting healthful behaviour for obesity-producing behaviour. (i.e. healthful behaviour modification). All this entails a major adjustment in lifestyle. But there is more! Fat people who become thin, especially the very obese, should expect more than just a thinner image in the mirror. People close to the weight loser may see him in a different light, treat him differently, or expect different things of him. This is not only because the weight loser is a different person (i.e. has changed his whole lifestyle), but also because what he was before, which is very closely related to the way he looks, is different. In other words, losing weight permanently entails not only a major adjustment in lifestyle, but also an equally major adjustment in personal interactions.

Losing weight permanently then is no easy task. Obesity needs to be recognized as a *disease* over which the patient has some control, and for which something can be done given the understanding, educational and supportive assistance of the therapists. Patience and moderate expectations (the "safe" rate of weight loss is about one to two pounds per week) are essential for both the dieter and the therapists. Just as the watched kettle is slow to boil, so the watched scale is slow to change. One should not expect to reverse a state like obesity in a short period when such a state is the result of one's habits over a lifetime. The patient must also be truly intent on losing weight permanently. The main predictor of success in any programme seems to be the person's conviction that he would be gratified by his own mastery of the problem.

The Prevention of Obesity

Perhaps one of the best ways to counteract obesity is preventing the condition in the first place. There is evidence that the tendency to adult obesity is established while the child is *in utero*, so maternal nutrition is important. In addition, since a child of age three who is obese will probably be an obese adult, the child's nutrition during the first few years of life is paramount. In part this may be because, at this time, he is vulnerable to increasing his number of fat cells. This represents not only another case for breast feeding, which allows the child to regulate his intake of a balanced diet, but also a case for common sense if breast feeding is not feasible. Concentrated formulas are popular nowadays, and the tendency is to over-feeding in order to achieve a quiet healthy child which all too often means that he is fat as well. In addition, solids are introduced into infant nutrition regimens far too early on the average (the earliest introduction should be at about five months of age and be gradual) and are usually given as a supplement to, rather than a substitute for, the milk or formula. In later childhood most western children continue to be over-fed and, unfortunately with a variety of inappropriate foods. Dietary habits are like most adult habits, they are established during youth. Therefore, just as we spend time educating our children in other matters, we should also educate them in the values of good nutrition and physical activity, both at home and in the school.

The Benefits of Weight Loss

Weight reduction is one of a very few areas where the loser is the overall winner. Other than the immeasurable psychological benefits of losing weight, studies have shown that concomitant with loss in weight come decreases in blood pressure (both systolic and diastolic), blood glucose, serum triglycerides, serum uric acid and even improvement of ECG tracings and heart size. By losing weight then an obese person can go a long way toward rectifying his own high blood pressure, diabetes, gout, arthritis, back problems and other disorders. Moreover, along with these disorders, some of which are risk factors for heart disease, he can also reduce other risk factors such as high blood fats. Therefore, since so many disorders can be combatted, and other disorders avoided, by losing excess fat, it does seem worth a serious and concerted effort. It seems to be a matter of life or weight.

Obesity is a disease of energy imbalance. Being such, it affects twentieth century western society to a startling degree. All the ingredients are there. The needs for energy expenditure are few: we ride in cars, buses, elevators, escalators and a variety of other mechanized devices; our entertainment has become home-oriented, as exemplified by the 40% of Canadians who watch 15 or more hours of television per week; and we are a society of spectators rather than participators. The availability of energy in our society is awesome: we are inundated with "quick food" outlets; "snack" and "junk" foods are pushed on us through seductive advertisements; alcohol is the mainstay of our social circles; meat, high in fat, has become the staple of our diets; and soft drinks have become almost essential to life. And to top it all off, society has become so large, impersonal and unsure that the elements of psychiatric disorders are there pushing the susceptible into the solace obtaining through eating, television and other such escapes.

However, there is a choice, and that choice is yours. Make it, and perhaps you too can be the thin, active person who lives a longer and happier life. But, if you know the risks and are willing to take them, please be the classical "happy fat person" — why compound your problems by feelings of guilt and other psychological ills. The choice *is* indeed yours, be happy in it!

THE HAZARDOUS HOLE

A Note for Engineering Tradesmen

The crew chief's task was to find the source of some fresh hydraulic fluid on the underside of his aircraft. After removing a panel, he found hydraulic fluid seeping from a pipeline in the top part of the compartment. He decided to test for the leak by running his finger along the pipeline, which was wet with the red fluid. As he ran his finger along it, the pipeline ruptured a little more, allowing a very fine stream of fluid to escape. As he passed his finger over the tiny stream (3,000 psi system), the tip of his finger was severed.

This is not the first time this type of accident has happened, and it probably won't be the last. Any liquid or gas, escaping at high pressure through a small hole, has the potential to do a lot of damage to the human body. Even if it does not sever the exploring digit, the fluid can penetrate the skin and damage tissues possibly necessitating later amputation of the injured finger, hand or arm.

Always treat high pressure pipe lines with respect. Any leak in a high pressure system must be coming from a hole somewhere in the system, and that hole can be extremely hazardous!

from AIR CLUES magazine

GOOD SHOW

MAJ S.P. HOLODUKE

On 27 March 1976, Major Holoduke was dispatched on a training sortie from Downsview Airport in Otter 9416.

About ten minutes after take-off and when approximately twenty miles east of Downsview, vibrations occurred in the aircraft. Maj Holoduke immediately turned to proceed toward Buttonville airport for an emergency landing so as to avoid built-up areas.

Further vibrations were noticed and despite no abnormalities showing on the engine instruments, the engine continued to gradually lose power. Different power settings were attempted momentarily with the higher settings resulting in severe vibrations. Mode 3/A, code 7700 was selected on the transponder and a "May Day" was broadcast.

It was now apparent that Buttonville was not within range and Markham Airport was therefore selected for the emergency landing. At this point, a more rapid power loss was experienced and Markham Airport now became unreachable. A loud back-fire was heard, oily fumes entered the cockpit and the engine seized, necessitating a forced landing in a nearby ploughed field.

The landing was successful with no resulting damage to the aircraft. Investigation revealed that the engine most probably ingested the number one exhaust valve resulting in the failure.

Major Holoduke's sound judgement and professional approach in handling this inflight emergency prevented the loss of an irreplaceable aviation resource.

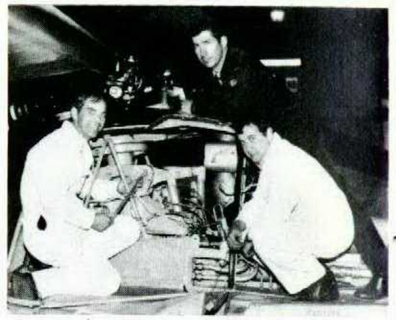
CPL J.M. TEMPLE

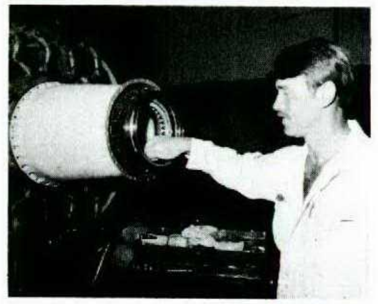
On the morning of 28 September 1977, Corporal Temple was a member of the groundcrew detached to Goose Bay in support of an Argus NORPAT. The crew were setting up to start the aircraft for the day's mission. A pick-up truck, DC energizer and AC energizer were parked, connected, in front of the Argus to supply ground power for the start. At approximately 0650L, the DC energizer was heard to change tone, accompanied by a bang and a clatter. Immediately after this, flames appeared from the engine.

Corporal Temple, without hesitation, ran to the energizer and directed a dry chemical extinguisher onto the burning energizer and shut it off. Immediately he had extinguished the flames, he disconnected the DC energizer from the AC energizer. Cpl Temple returned to the truck and pulled the offending DC energizer clear of the aircraft. It was subsequently discovered that the DC energizer had thrown a connecting rod, blowing a hole in one of the cylinders.


Maj S.P. Holoduke


Cpl J.M. Temple


Sgt D.L. Barnes
MCpl E.H. Soper
Cpl G.C. Drover


Cpl A. Varga

Corporal Temple's swift action undoubtedly prevented more serious damage to the GSE, not to mention the conceivable damage which could have occurred to the Argus aircraft parked in close proximity to the energizer.

CPL G.P. COULTER

While assigned to carry out a daily inspection at night (an extremely cold winter evening) on a CF-104 aircraft, Corporal Coulter discovered a crack in the boundary layer bleed air diaphragm. The aircraft was immediately put unserviceable and action was taken to have the situation rectified. Only by conducting a comprehensive inspection, well beyond the established requirements, was the potential danger of a serious in flight hazard discovered by Corporal Coulter and/or catastrophy averted. His performance on this occasion is indicative of his thorough and professional approach to his duty.

SGT D.L. BARNES
MCPL E.H. SOPER CPL G.C. DROVER

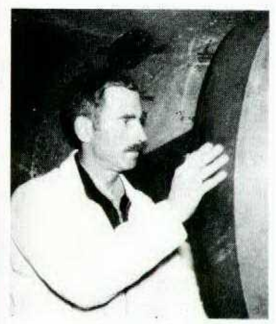
An SI directed by NDHQ had called for an NDT inspection to be carried out on the upper control bolts of the CH113 and CH113A helicopters and the bolts were ready for re-installation. Master Corporal E.H. Soper and Corporal G.C. Drover discovered one of the bolts appeared short and did not require the same number of washers the previous bolt had. This lead Sergeant D.L. Barnes to check the bolt length and to confirm the stretch limits of the bolts. Of the five bolts checked, two were stretched considerably beyond tolerances. As this particular bolt serves in a most critical position in the control system of the helicopter, failure would result in a catastrophic accident. Instead of removing a washer and continuing with the job, Sgt Barnes, MCpl Soper and Cpl Drover persued this irregularity and may well have prevented a serious loss of resources.

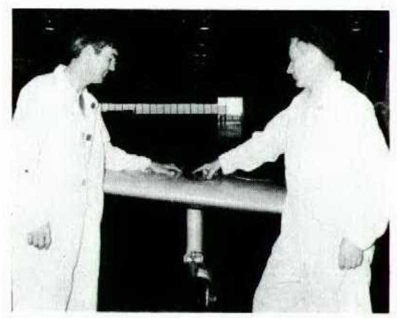
Sergeant Barnes and his crew through dedication and perseverance demonstrated their professionalism by following up what might have been an easily overlooked anomaly.

CPL A. VARGA

During a major maintenance program on a J-57 engine, Corporal Varga was detailed to carry out a parts build-up on a component recently received from a civilian contractor. While working on this component Cpl Varga carried out extensive visual checks not normally required on new components. Although his vision was impeded considerably, due to the make up of this component, using a flashlight he discovered that an internal air baffle was missing and had not been installed by the contractor during component overhaul. Should this component have been installed without the baffle, turbine cooling would obviously have been affected.

Corporal Varga's alertness and dedication to the job at hand prevented an unserviceable component from being installed, thus averting possible engine problems during flight and many more manhours desnagging an unserviceable engine. Corporal Varga's thorough checking exemplifies the contribution made to flight safety by resourceful personnel of the Canadian Forces.


Cpl G.P. Coulter


Cpl J.B. Steele


Pte S.W. Ridder


MCpl G.C. Theriault

CPL J.B. STEELE

While Corporal M.C. McAllister was engaged in carrying out an "A" check on a CT134 Musketeer aircraft, Corporal J.B. Steele approached him to discuss a first line servicing technical matter. While in discussion, from his position at the right hand leading edge of the aircraft wing, Cpl Steele noticed what appeared to be a crack in the paint surface of the wing. Observing that the paint appeared to be loose, with his thumb nail he flicked a little of the paint off disclosing a surface flaw in the skin. He mentioned this to Cpl McAllister and together they removed sufficient paint revealing what appeared to be an one and one-half inch crack. This was immediately reported to their Sergeant and the aircraft was placed unserviceable.

Liquid Penetrant Inspection did not fully confirm cracking so the aircraft was subjected to the Eddy Current method of NDT by the Moose Jaw NDT facility who confirmed that it was a crack.

The alert, heads up maintenance attitude displayed by Corporal Steele, even though it was not in his immediate area of responsibility, exemplifies his personal high degree of professionalism and deserves service wide recognition.

MCPL G.C. THERIAULT

During the pre-flight inspection of a Sea King helicopter, Master Corporal Theriault noticed that all the bolts connecting the pitch change links to the tail rotor blades were installed backwards. The inspection of the tail rotor area, let alone the installation of these small bolts is not part of the Navigator/Observer pre-flight checklist. Through his timely and devoted attention to detail beyond the required standard, MCpl Theriault averted a potentially serious failure of the tail rotor control system with its inherent hazard to flight.

PTE S.W. RIDDER

Private Ridder is an Aero Engine Tech at CFB Trenton. He is awarded a Good Show in recognition of his dedicated on-the-job performance as reflected in two recent occurrences involving vastly different aircraft types.

On the first occurrence, Pte Ridder took the time to investigate a fluid drip in the nose wheel well of a Boeing aircraft, which had just started engines after a fast turn-around at CFB Trenton. The fluid drip proved to be inconsequential but Pte Ridder's investigation led to the discovery of a loose bolt in the nose gear linkage. The aircraft crew was advised and the engines were shut down while the snag was corrected. Subsequently, it was found that the drag brace bolt had been improperly lock-wired and had worked loose.

The second occurrence involved a visiting CF5. While refuelling this aircraft, Pte Ridder noticed a loose nut on the nose-wheel landing gear down-lock.

Further investigation revealed that both nuts were loose creating a potentially hazardous condition.

In both of these cases Private Ridder displayed a truly professional approach to his job. His alertness and attention to detail could very well have averted an aircraft accident.

CAPT G.N. THORNEYCROFT CAPT B. C. GIVEN

Captain Thorneycroft, pilot, and Captain Given, Electronic Warfare Officer, departed Winnipeg early Saturday evening, cross country to Cold Lake, in a CF100 aircraft. During the departure, Winnipeg terminal provided radar vectors to avoid the thunderstorm activity. Just prior to level off at 34,000 feet, in cirrus cloud, a loud bang was heard and the right engine flamed out, filling the cockpit with smoke. High pressure and low pressure cocks were closed and a check for fire proved negative after the smoke had cleared.

The power was reduced below 85 percent on the left hand engine, an emergency squawked and declared. Winnipeg ATC immediately approved a request for an RTB to Winnipeg and a descent to 7,000 feet. Halfway through the turn a hole was discovered in the cloud, circled by CB's. A VFR maximum rate descent to 7,000 feet was carried out; however, cloud and heavy rain were encountered on level off. 4,000 feet was requested and approved.

Captains Thorneycroft and Given had immediately, and correctly, suspected the supercooling effects of thunderstorm activity as cause of the engine failure, and, as per checklist procedures, had been operating the good left engine below 85 percent power since initiation of descent. As the aircraft was extremely heavy with fuel, the decision was made to jettison the tip fuel in a clear area shortly after level off at 4,000 feet in order to help maintain a lower power setting.

Again heavy rain was encountered with lightning in the area, and Winnipeg advised the crew of a thunderstorm in progress at the airfield. The exigency of the situation precluded the thought of other than a straight in approach to runway 13 of Winnipeg. Captains Thorneycroft and Given decided they would break-off to the northeast if the runway was not sighted, rather than fly a single engine missed approach over the city of Winnipeg. As they approached on Winnipeg terminal vectors, now at 2,000 feet, they were informed that GCA could not pick them up due to heavy precipitation. At about three miles there was nothing to see and nothing to do but start a missed approach to the northeast where a clear spot had been sighted earlier. They were cleared for a turn and after about 40 degrees of turn the crew suddenly saw the glimmer of the approach lights off the right hand side. The gear and flaps were lowered and an "S" turn enabled Captain Thorneycroft to land the aircraft safely.

Subsequent maintenance investigation revealed that the left engine, (the good one) was totally

Capt G.N. Thorneycroft
Capt B.C. Given

Capt N.N. Sinclair

Maj J.M. Scott Capt N.N. Sinclair

unsuitable for further use and was reduced to usable spares and scrap. Internal damage was found to be extensive due to the supercooling effect of thunderstorms. Maintenance personnel advised that had higher power settings been used the left engine would certainly have self-destructed.

Captains Thorneycroft and Given are to be commended for their rapid decisions concerning their disposition in an extremely critical single-engine emergency. Their cool, professional handling of the aircraft and their knowledge of Engineering Order procedures when encountering supercooling symptoms undoubtedly prevented the loss of an aircraft.

MAJ J.M. SCOTT CAPT N.N. SINCLAIR

On 30 September 1977, Captain Norm Sinclair and Major Mike Scott were two members of a section of four CF-5s being re-deployed from Prestwick, Scotland to Goose Bay, Labrador.

One hundred and fifty nautical miles south of Greenland, Maj Scott's aircraft experienced a left engine compressor stall and flame-out at 30,000 feet. Following a declaration of an emergency the tanker descended to 20,000 feet with the four fighters. During the descent Maj Scott tried a number of unsuccessful relights. After leveling-off at 20,000 feet Maj Scott realized he could not maintain 20,000 feet on one engine without the use of afterburner. If he either descended further or used afterburner to maintain altitude he would not be able to reach his destination at Goose Bay or his diversion field at Sondrestrom, Greenland. It was at this time the tanker crew suggested the use of the airfield at Narssarssuaq, Greenland. Narssarssuaq was a 6,000 foot airstrip of unknown serviceability at the end of a fiord. To further complicate matters, there was no UHF radio communication with the airfield.

Upon locating Narssarssuaq, Maj Scott remained at 10,000 feet while Capt Sinclair flew a number of visual reconnaissance passes to determine the condition of the airfield and the most suitable approach path for Maj Scott. Due to the airport's location, Maj Scott would not have been able to complete a successful overshoot should his final approach have to be aborted.

Following the airfield recce and some discussion, Maj Scott flew a successful single engine approach to Narssarssuaq. Capt Sinclair landed behind him.

The reaction and team effort of these pilots eliminated the tragic potential of this incident. Captain Sinclair and Major Scott are to be commended for displaying sound judgement in a critical situation.

CAPT N.N. SINCLAIR

On 12 October 1977, Captain Norm Sinclair was flying number two on a two plane tactical mission, each aircraft carrying two live MK 82 bombs and inboard pylon tanks. Capt Sinclair was at about 300 feet when he experienced a left hand engine failure. While climbing and following relight procedures for the left engine, Capt Sinclair noticed that the right engine was compressor stalling. At this time Capt Sinclair jettisoned all external stores. In order to maintain relight airspeed he had to put his aircraft into a shallow descent. As the left engine was now operating at reduced RPM to prevent overtemp, the right engine was selected off so as to start a second relight attempt, which was successful. The right hand engine was held at a reduced power level as the engine instruments fluctuated. The left hand engine RPM was further retarded to keep EGT within limits. Without warning the left hand engine flamed out. The right engine was advanced slowly to military and when the engine instruments stabilized, after burner

Mrs. A. Schmidt

Mr. D.F. Kuniski

Sgt G.J. Aucoin
Sgt H.R. Winter

Cpl R. Meadwell

was selected in order to gain altitude. By this time the left engine showed signs of seizure so its throttle was placed to cut-off. Capt Sinclair continued back to Cold Lake for a single engine approach and successful landing. The total time span from the first compressor stall to commencement of RTB was approximately three minutes.

Throughout the period Captain Sinclair maintained a continuous check on his VSI to ensure he was not developing a sink rate. Each time he considered ejection due to deteriorating conditions, his corrective actions kept alive the possibility of a successful recovery. Captain Sinclair's thorough understanding of the CF-5 and its emergency procedures and his coolness under pressure prevented loss of a valuable aircraft, without jeopardizing the safe ejection parameters which were clearly established throughout.

MR. D.F. KUNISKI MRS. A. SCHMIDT

On the evening of 1 December 1977, Mr. Kuniski and Mrs. Schmidt, civilian employees of CFB Cold Lake, entered number six hangar to do their work. Upon crossing the hangar they detected fuel fumes and observed fuel leaking from a 707 which was parked in the hangar. As no servicing personnel were available, Mr. Kuniski phoned the fire department which took immediate corrective action.

This fuel leak, had it gone unnoticed would have created a serious fire hazard. The prompt action taken by these civilian employees prevented this from occurring.

SGT G.J. AUCOIN SGT H.R. WINTER

While undergoing unit check out Sergeant Aucoin, under the supervision of Sergeant Winter, was controlling a CF-5 on final approach when he noticed pop up traffic directly ahead of the aircraft. He immediately notified the pilot who when he looked ahead saw a large flock of geese. Violent evasive action was required to avoid a multiple birdstrike. The birds were missed by approximately 50 feet.

As this occurred shortly after the aircraft had intercepted the glide path, it is doubtful that the pilot would have seen these birds in time to take avoiding action.

The alert reaction of the controllers in calling the "Pop Up Traffic" undoubtedly saved a CF-5. They are to be commended for their timely action.

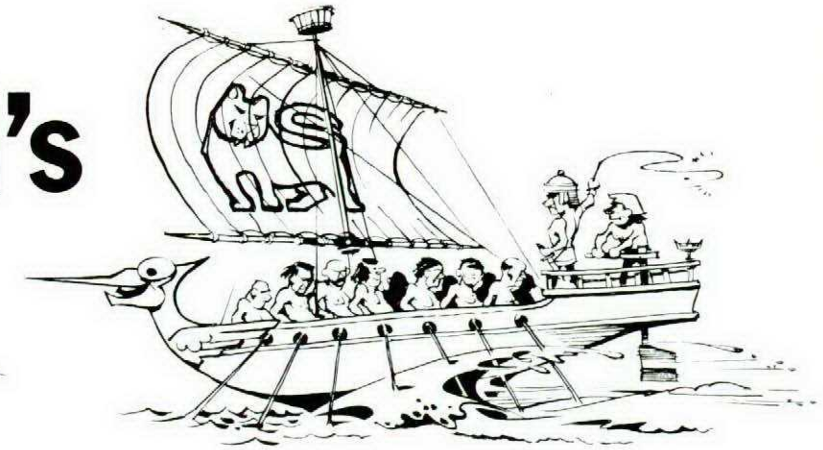
CPL R. MEADWELL

Corporal Meadwell was carrying out a routine inspection of the control rods on a Sea King Helicopter. In the auxiliary hydraulic compartment, which is an area that affords very little freedom of movement, he discovered that one of the control rods appeared slightly curved. Upon further inspection, it was revealed that the rod was bent one half inch out of alignment, indicating that excessive pressures had been applied to the control system.

As a result of Cpl Meadwell's discovery, the aircraft was grounded, and a complete inspection of the entire control system carried out. The defective part was returned to Shearwater for a more comprehensive investigation, and the aircraft grounded until return from sea.

Because of Corporal Meadwell's attention to detail, and responsible attitude toward his duties, a possible flight safety hazard was detected, and accident potential avoided.

The Admiral's Question



by Byron Farwell

The admiral of a fleet of galleys manned by slaves reached for a sheet of papyrus one day and dashed off a note to one of his captains: "How fast can your ship go?"

Captains take seriously the questions of admirals, and this captain, a graduate of the Tyre Naval College and of the Byzantine Business School at Constantinople, prepared to give the admiral's question top priority. Being action-oriented, he called in his systems analysts and hired outside consultants and gave them mission-oriented orders. Meanwhile, he conferred on a less scientific basis with some of his colleagues, for for a number of tension-producing questions had immediately sprung to mind: Why is the admiral asking such questions? Does he doubt my ability to obtain optimum results from my ship? Is he considering the trade-off benefits of switching from galleys to sail? If this happens, what is the future of galley captains, specifically *me?* How can I influence any decision that may be made? Who are the real decision-makers? Who do I know at CinCMed? Who was that guy in the CNO's office I bought Greek wine for last year?

While the captain wrestled with these questions, his analysts went to work. The first step, of course, was the definition of the problem. The galley, they saw, was a homo-mechanical system comprising, basically, a number of homogeneous sub-systems which were also homo-mechanical. The man-machine mix had to be examined and quantified. Statistics on the average weight and age of the slaves were compiled and the importance of these factors was mathematically computed. Materials control specialists provided data on the length and weight (wet and dry) of the oars. The psychological effect of atmospheric conditions on the slaves was a variable to be taken into consideration. Sea conditions provided another variable. Acceleration measurement problems posed doubts about the prevailing state of the art.

Socio-economic and political considerations were not very relevant, but it was thought that this input (provided by consultants from Phoenicia University) might be useful in answering follow-up questions and, in any case, would demonstrate the thoroughness of the analysis.

The admiral, not receiving a quick answer to his question, repeated it, adding, "What the hell is going on down there?"

This mild expression of irritation caused whiffs of panic to swirl through the galley. Tension increased, tempers grew shorter, and there was much burning of midnight oil and flogging of slaves. The greek slaves toiling over their whirling abacuses had a particularly hard time. However, within 62 hours an interim report was ready for the captain's signature. It was long and included several appendices, but it gave a clear picture of the progress made on Phase I — defined the area of inquiry, explained the difficulties being encountered, outlined the nature of future research, praised the selfless dedication of those working on the task, and assured the admiral that all concerned were confident of the ultimate success of the project. One of the appendices detailed the costs incurred so far and gave refined estimates of future costs.

The admiral was taken aback when this report arrived on his desk. The son of a fisherman, he had come up from the ranks and had not had the advantage of having attended Tyre or Constantinople; he had been out chasing pirates when it had been his turn to go to staff college, so he missed that too. At 55 he was considered over-age in grade — well past the years when he could be considered capable of innovative thinking. In spite of his fine combat record and intimate knowledge of ships, he knew that the king was beginning to listen to those who suggested that he be replaced by a younger man.

The admiral looked at the captain's report: 382 pages of legal-sized papyrus. Glancing through it, he noted the many long equations and unfamiliar words. He decided to turn it over to one of his brighter staff officers for evaluation. What he told the staff officer was: "Boil this crap down to two pages."

Within a week the admiral was given a neat two-page report — though there was a one-page appendix which the staff officer could not resist including, which contained a fascinating graph of his own construction that vividly illustrated the big picture of the entire project. The report told the admiral that the captain was certainly tackling the project energetically, that he had the correct approach, that all concerned organizational elements had been plugged in, and that all technical aspects were being covered. The staff officer added his personal conviction that the captain and his people would succeed. He also noted that there were a few errors in some of the original equations, but added that these had been corrected and that the appropriate people on the captain's staff had been notified.

In submitting his report the staff officer told the admiral that he had put a thousand scribes to work reproducing the report and that some of these had already been sent to department heads and technical people. He asked the admiral what further distribution he would like to make.

The admiral, feeling the forces of higher education closing in on him, did not reply, but stared out the window at the sea. It had never seemed so far away. The staff officer, thinking that his chief wanted to consider his options, quietly left. The admiral continued to stare out the window; then he arrived at a decision — on his own and by a process involving

cont'd on page 19

Through a Dark Glass

by Maj Jack Soutendam, DCIEM

To see, we need light. Almost every living thing is sensitive to light. In the human, seeing is the task of the eye and brain. Someone once said, "Riches abound for him with the sharpened eye. . .", but it extends much further in that good vision is of the utmost importance in survival. Unfortunately, in seeing there are many problems to be solved. The human eye is a beautifully contrived optical tracking system of extreme complexity and specialized tissues.

Basically a crystalline focussing lens gives minute upside down images to an incredibly dense collection of light sensitive nerve cells which have the task of converting light energy into electrical impulses, a language the brain can understand. This coded neural activity represents, or is, the object. Thus, contrary to popular belief, there is no internal picture involved. Visible light is only a very narrow region of the total electromagnetic spectrum with the physical difference being the wavelength of the radiation. The narrow band to which the human eye is sensitive falls approximately between 400 (violet) $m\mu$ and 700 (red) $m\mu$. An important distinction to be made is that of colour as a sensation and colour as a wavelength of the visible spectrum light entering the eye. Light itself is not coloured but with a functioning eye and brain, sensations of lightness and colour are produced, giving rise to descriptions such as blue, green, red, etc. It will be necessary that the brain accepts the total neural stimulus as representing an object, if a "colour" is to be perceived.

As was said earlier, to see, we need light. Unfortunately, sunlight contains invisible rays potentially dangerous to the eye, and when the light intensity is sufficiently high, retinal sensitivity can be appreciably reduced, light scatter in the ocular media can occur and contrast and visibility can be reduced. It has been suggested that to accomplish the flying task, approximately 80% of the necessary information is gathered by seeing. If an unprotected eye is exposed to high intensity sunlight, extreme discomfort, fatigue and temporary blinding may occur. It will be necessary to control the light entering the eye, and the method of absorption appears to be effective. The purpose of the use of sunglasses for outdoor absorption is to decrease the solar intensity on the eye. Ideally, sunglasses should enhance visual performance and comfort by attenuating the visible light portion of the electromagnetic spectrum to which the eye is sensitive and totally absorb the remaining wavelengths. That is difficult to do.

Neutral absorption lenses help solve some of these problems, with frequently a calming and stabilizing effect (comfort) on the user. Absorption percentages for these lenses are high, and ordinarily not less than 80%.

It is important that absorption is truly neutral and effectively uniform over the entire visible spectrum. The response of the attenuated eye will be essentially parallel to that of the unaided eye in all but perhaps the most uncommon of daylight situations. The question of ultra-violet and infra-red radiation absorption is a more complex one to deal with. Longer wavelength UV spectrum is considered harmless although it may cause certain transparent media to fluoresce, the middle UV spectrum aids in the production of a summer tan and vitamin D and the very short UV does not occur in the atmosphere. Plain window glass filters out much of the direct sunlight ultra-violet and sunglasses exclude ultra-violet below 340 $m\mu$. With regard to absorption of infra-red rays, it is suggested that plastic cannot filter this out, so that optical glass appears necessary for protection.

The need for eye protection is clear and requires a filter to be effective in bright sunlight, excluding not less than 80% of whole light relatively evenly over the visible spectrum, with absorptive capacity in the non-visible ends of the spectrum. The sunglasses should provide: (1) reduction of light without optical or colour distortion, (2) exclusion of heat producing infra-red and most of the ultra-violet portion of the spectrum, (3) improvement of clarity and visual performance under adverse outdoor light, (4) prevention of eye strain and headaches and, (5) improvement in dark adaptation when required.

Among the more specialized protective glasses now available for specific outdoor needs of intense light and reflected glare are: (1) gradient density coating lenses, mirror like in appearance, (2) photochromic lenses with the property of changing in density depending on the amount of ultra-violet light exposure and, (3) polarizing lenses. You may have noticed that it is difficult to look through a window at an angle of between 35^{o} and 55^{o} as a result of glare or luster reflected from that flat plane. Polarizing filters have the property of completely removing that luster or glare when viewed at the specific 55^{o} angle. On an undisturbed water surface, with light reflecting on it, viewing it at the suggested angle would allow an observer to look right down into the water. Looking at the surface, be it glass or water, at any other angle would diminish this polarizing effect until at a 90^{o} angle it would be non existent. Caution must be exercised when using polarizing lenses while looking through window glass containing a polarizing filter itself, such as found in some aircraft.

Two crystals with the same molecular structure can be placed face to face in one position and will transmit all light. When one filter is turned, a point will be reached at a position perpendicular to the other filter when no light is transmitted. It has been suggested that for inflight use polarizing lenses could be potentially hazardous by changing the flicker frequency of light reaching the eye, possibly causing vertigo. It could also become difficult to determine land and water surfaces during critical phases of flight.

Polarizing sunglasses are usually plastic, which are inefficient in their heat absorbing (infra-red radiation) properties. The wearer may be tempted to gaze at sources of intense light with potential injury resulting. The pupil size may be larger than in the unaided eye, increasing radiation intensity (heat) at the retina.

The potential problems associated with the wearing of photochromic lenses have been well documented and their use in any form of military operational activity is discouraged. In addition to transmission and absorption limitations, the mechanical and optical properties of photochromic glass are temperature dependent and in the wide Canadian climatic extremes, operational limitations for the wearer could be unacceptable. (Military personnel should acquaint themselves with the orders dealing with the use of photochromic lenses.)

It appears that for critical operations under adverse outdoor light conditions, the absorptive lenses satisfying the require-

cont'd on page 22

Human Factors in War
—partVI

specially for Flight Comment
By Robert Rickerd

Emerson might have said "Professor, build a better fighter plane and the Luftwaffe will beat a path to your factories," instead of the better known "build a better mousetrap. But for one of Germany's top aircraft design talents of World War II, success, with the exception of a single design was to evade a prolific lifetime of work and reward Ernst Heinkel instead with frustration.

The one exception was of course the Heinkel III medium bomber, 8,000 of which were produced, though this Luftwaffe workhorse did not satisfy Heinkel's dream of putting a high speed fighter into mass production, its popularity did however help to provide the technicians, factories and workers which allowed him to embark on several notable projects. The fact that these fighter projects did not (fortunately for the Allies) mature to large scale production was in no way due to poor design.

Ernst Heinkel, a tinker's son, was born at Grunbach in Wurttemberg in 1888 and only 23 years later constructed the first of many workmanlike designs which were to make his name a household word in Germany during the later 1930s. After gaining experience at the famous Albatross and Hansa Brandenburg works in World War I, Heinkel worked briefly at the Caspar factory before establishing his own company in December 1922 at Warnemunde on the North German coast. As German aircraft production was severely controlled at that time by the Versailles Treaty, he arranged for a Swedish firm to build some of his designs.

Soon the Professor developed a shrewd business sense to go with his creative genius. He was an excellent judge of men and surrounded himself with hard working and far-seeing designers like himself. But there was a chink in Heinkel's personality. It was an idealism which deceived him into believing that he could attain success under Hitler's regime solely on his industrial contributions without sacrificing the independence of thought and action which he had been reared to believe was the heritage of every man. This self-deception, coupled with a fierce belief in his right to be judged fairly on the merits of his work, led to bitter encounters with rival designers and members of the Luftwaffe hierarchy, notably State Secretary Milch and Ernst Udet the Director of Air Armament. Later, when the bespectacled little man refused to subvert his ideals to maintain his position in the Reich, control of his factories was turned over to a bureaucrat by the Luftwaffe.

Unfortunately for Heinkel and others like him, Hitler had selected some of his lieutenants for their personal propaganda value in the beginning, to assist him in attaining power. Incompetent men like Goering, who was not fit to command a squadron let alone a whole air force, were allowed to recruit other incompetents like themselves and so it went. A shortage of responsible, experienced officers and administrators in the Luftwaffe soon resulted in chaos where infighting and influence peddling could not help but affect the efficiency of the service.

The Professor had dreamed of producing a fast, single-seat fighter — the aristocrat of aircraft and the supreme design challenge since September 1927, when he had watched the Supermarine S5, a forerunner of the Spitfire, take the Schneider Cup for Britain at Venice, Italy, with a speed of over 280 miles per hour.

His He37, He38 and He49 which led to the He51 got the biplane configuration out of his system, and when a requirement was issued by the Nazis for an ultra modern single-seat monoplane fighter in 1934 he produced a beautifully streamlined aircraft which was superior to three of the other four competitors. The other surviving contender was the Messerschmitt 109. The He112, as Heinkel's design was designated, had better ground handling visibility and landing performance, a smaller turning circle, lower wing loading, better climb, service ceiling and manoeuverability, but was 20 per cent heavier and more complex to manufacture. Typically, Heinkel continued development of the design ignoring the lack of official interest, but despite refinements during which 600 pounds were trimmed from its weight and the structure simplified, the plane was turned down by Air Armament Director Ernst Udet who suggested Heinkel solicit foreign orders!

Heinkel was furious. He had little love for the Nazis and at first refused to fly the Swastika flag over his factories. Now he determined to produce a fighter so superior to that of his hated competitor Messerschmitt, that the Luftwaffe would be unable to ignore it.

At his own expense the Professor began development of a 450-mile-per-hour design in a new effort to get into the fighter business. When it flew early in 1938, the He100 not only bid fair to capture a Luftwaffe contract, but showed promise of capturing the propellor-driven world speed record which had been held by Italy for four years. In March 1939, the eighth prototype raised the record by 23 miles per hour to 463 mph.

But Heinkel's rival Messerschmitt came back to haunt him once again. Less than a month later, a specially-built Me109 raised the speed record a further five miles per hour, a record which was to stand for 30 years. Though Hitler himself had sent Heinkel a personal telegram of congratulations on his speed record, Messerschmitt's effort had eclipsed the He100, and the first flight of the Focke-Wulf 190 on June 1st removed all possibility of it becoming an alternate Luftwaffe choice for production. It was just as well for the Allies.

The Messerschmitt record breaker of course bore no similarity to the standard Luftwaffe fighter, while the Heinkel, though modified, in its original form was a better plane than the standard Me109. The He100 much resembled the American Mustang which was to become in some pilots opinions the best fighter of World War II, and preceeded it into the air by more than two and one half years! Heinkel was undaunted however, for he had been working on something better.

Heinkel's interest in speed and his uncanny appreciation of talent and new ideas, had led him in 1936 to hire Hans Joachim von Ohain and Max Hahn. Ohain, a physicist, had patented a turbojet system for aircraft the year before, and Hahn, an automotive and railway engineer, had built the first model. The Professor gave them the facilities to develop a prototype engine and his designers produced an aircraft for it to power. So it was that on August 27, 1939, Germany became the first country to fly a jet aircraft — more than 20 months before Britain and three years before the United States. But further development of this single-engine design was turned down by Udet once again!

The HE178 test aircraft was followed into the air by the Heinkel 280 twin jet fighter on the 2nd of April, 1941 — another first for Heinkel and Germany. The revolutionary new weapon possessed a speed of almost 500 miles per hour, featured the first pilot ejection seat, had three 20-millimetre cannon and could outmanoeuvre the Focke Wulfe 190 in mock combat. But once again, success evaded Ernst Heinkel. Milch was skeptical that the He280's tricycle undercarriage arrangement would be practical in front line service!

Willi Messerschmitt, his old rival, had also developed a jet fighter, which although it did not fly until more than 15 months after the Heinkel 280, originally used a tail wheel landing gear and thereby captured the production contract. Heinkel was the bridesmaid once again.

Fortunately, the Professor did not believe in putting all his eggs in the jet propulsion basket. His design group had been developing a new twin piston engine aircraft as a private venture which was to be known as the He219 "Owl". General Kammhuber, who was head of the night fighter wing of the Luftwaffe, was in desperate need of an aircraft to throw against the British bombers in 1942, and when he heard of the high performance "Owl", sent his leading night fighter Aces to the Heinkel works to supervise development. The design outclassed its rival, the Junkers 188, performance-wise and was one of the finest twin engine propellor-driven night fighters of the war on either side. But Milch (no doubt noting the tricycle undercarriage of the Owl) decided against full production of the type and less than 300 were produced.

The frustrated designer had one more try at producing a winning fighter design and this time the jet propelled He162 "People's Fighter" as it was called, was finally the recipient of an order for 1,000 machines a month!

The new plane, like all the other Heinkel designs was unique in its own way. Built of non-strategic materials, and so unsophisticated that it could be built by semi-skilled labor and flown by briefly trained Hitler Youth, the He162 was developed from drawing board to first flight in the remarkably short time of 69 days — another record. But it was 1945. Less than 400 were produced before the end of the war and none saw action. Heinkel had seen his goal of mass production vanish as quickly as it had appeared.

The six brilliant Heinkel fighter designs which attained flying status in the nine years between 1935 and 1944 resulted in a total of less than 800 aircraft, only a tenth of his He11 bomber production.

For years after the war's end aviation activity in Germany was virtually suspended, so Heinkel continued in other spheres of business in the interim, living to see his company return to aircraft production. But when he died in 1958, he still had not achieved his dream of seeing one of his fighter designs take to the air in large numbers.

cont'd from page 16

emotional factors and some irrational thinking — he went fishing.

By the time the second interim report, elegantly bound, was submitted, the admiral had been replaced by a younger flag officer who had immediately made a clean sweep of the old admiral's programs and the entire project was scrapped.

Six months after taking command, the new admiral, whose experience had been confined to sail, wondered how fast a galley moved and sent a query to the captain of the same galley. By this time, of course, the original captain had been transferred and he was now deputy assistant commandant of the Tyre Naval War College. The new captain, having been educated at Tyre and Constantinople, fell prey to the same anxieties and took the same action as his predecessor: analysts were called in, outside consultants were engaged, and in the course of time there was a first interim report.

Fortunately, we learn from history. Men have discovered through analysis that the basic problem was the need for better propellant systems, which could provide not only increased acceleration but a better man-machine mix. Fortunately too, admirals have learned not to ask over-eager subordinates irrelevant questions.

Webster's Seventh

An accident is defined in Webster's seventh new collegiate dictionary as an unfortunate event resulting from carelessness, complacency, ignorance or unavoidable causes.

A review of aircraft accidents leads me to believe that unavoidable would not be an appropriate cause. Ignorance, defined in the same reference, as destitute of knowledge, is also not appropriate, especially in view of the initial requirements for aircrew training and the seemingly endless hours devoted to elimination of ignorance.

Complacency is defined as self-satisfaction accompanied by unawareness of danger. This condition appears to be prevalent in several of our accident reports.

Carelessness is defined as unconcerned, indifferent, slovenly, or negligent. These terms also seem to apply at least to a degree in several of our accident sequences.

This definition appears to be fairly accurate, right there in Webster's seventh.

Air Command Study Kit

THE SCUBA DIVING AVIATOR

by Maj Jim Pfaff
Base Surgeon, CFB Ottawa

Not satisfied with having "slipped the surly bonds of earth, and danced the skies", as John Gillespie Magee so aptly described it, the modern day aviator has, in increasing numbers, sought the beckoning depths of the sea. American author Peter Benchly has, in the past few years, encouraged Scuba Diving by showing beautiful Jacqueline Bissett in a marvellously transparent T-shirt then scared the tanks off everyone by presenting "Jaws".

Fun in the sun tours, Club-Med and assorted other package tours have lured the winter-weary Canadians to the warm Carribean waters and the marvels of Scuba Diving and the potential hazards of mixing two pressure environments in quick succession.

From day one the budding aviator, be he pilot, navigator, flight engineer, etc, has had pressure phenomena explained to him under the heading of decompression or dysbarism. Dysbarism refers to the study of physiological changes in the body due to the exposure of that body to changes in barometric pressure. Sea level is considered to be at one atmosphere (1 atm.) or 14.7 psi. As aviators we've exposed ourselves to pressures that are less than 1 atm. as soon as we leave the ground. The change in pressure between sea level and 18,000 is 0.5 atm. And as most have experienced, the greatest change is in the lower thousand feet. Looking at the sea, we experience hyperbaric changes or increase in pressure as we descend. The pressure changes in the sea vary at a fixed rate according to depth ie; for every 33' of depth, there is an increase in 1 atm. or 14.7 psi. Despite the difference in degree of change of pressure the aviator and scuba diver are on common ground when it comes to the effects of these pressure changes. These changes in pressure produce certain fixed changes in the gases within us, specifically:

a. As expansion and compression of trapped gases, resulting in effects on ears, sinuses, abdomen and teeth.
b. As evolved gases from body fluids and tissues resulting in such symptoms as bends, chokes and other neurological disorders.

Let's look at expansion of trapped gases first.

As cloud punchers we've all felt the effects of trapped gases on ears and sinuses when we flew with a slight head cold, or how about selecting 100% O_2 after eating cornbeef and cabbage?

Well the scuba diver faces these same problems only he terms them "squeeze" and they occur in ears, sinuses, lungs, teeth, facemasks, dry suits, etc.

So basically, the same rules apply to both environments when it comes to colds, diet, etc. Anything that will prevent gases from escaping or entering freely will result in problems.

Now the big one; evolved gases and an area that aviators have been exposed to in lectures but probably few have experienced much in the way of actual symptoms. I'm talking about decompression sickness: the Bends.

The initiation of disorders resulting from evolved gases is best understood by considering the characteristics and types of gases that are normally in solution in the body fluids and tissues and which are in an ever-changing balance with the gases in the lungs, the surrounding ambient pressure and the active metabolic state of the body.

The body contains about 1 litre of dissolved inert Nitrogen together with certain amounts of chemically active Oxygen and Carbon Dioxide that are also dissolved in solution. However, more importantly the Nitrogen is stored or dissolved in large quantities in the fatty tissues of the body.

The amount of any gas dissolved in the body is dependant upon the particular solubility characteristics of the gas and is also directly proportional to the partial pressure of the gas with which the liquid is equilibrated in accordance with Henry's law for dissolved gases.

Carbon Dioxide and Oxygen are both metabolically active and diffuse between tissues freely. The metabolically inert Nitrogen remains in a relatively steady state of equilibrium with Nitrogen tension in the lungs and atmosphere. However, with ascent the equilibrium is upset the tissues and fluids become supersaturated compared with the ambient air and Nitrogen tends to be evolved from solution as bubbles, to regain the equilibrium. It's these bubbles, submicroscopic and larger, which are believed to produce the painful symptoms of bends by collecting in joint spaces and in muscles. The more advanced signs of "chokes" are due to larger bubbles collecting in the pulmonary capillary bed. The neurological signs are due to disturbance in brain blood perfusion because of the bubbles. It has been shown that the incidence of dysbarism increases with rate of ascent, peak altitude, duration of exposure to altitude, exercise and muscular activity, cold and obesity.

On the other hand, the diver is exposing himself to greater ambient partial pressure of Nitrogen so in order to restore the equilibrium, Nitrogen enters the tissues. The rate of uptake of Nitrogen depends on time of exposure, rate of exposure, and type of tissue.

The diver has been taught how to cope with the increased Nitrogen in his tissues when returning to the surface. He applies decompression tables, a time delay factor, which allows an equilibrium to be established in the body which will prevent the Nitrogen from evoluting as gas bubbles and causing decompression sickness. This rate of return to equilibrium is not constant for all types of tissues in the body. Some tissue remains supersaturated at the surface. These tissues will slowly equilibrate over a period of time at the surface.

Now consider the case where a scuba diver finishes a dive and several hours later takes off in his or someone else plane to higher altitudes. If he has not allowed time for his tissue to equilibrate the Nitrogen partial pressures, he exposes himself to a greater pressure gradient than normal and Voilà he is more susceptible to Nitrogen going into bubbles in his fluid and tissues and suffering the bends.

The literature reveals only a handful of reported cases of decompression sickness over the last 10 years. These range from minor aches to full blown neurological problems with headaches and motor and sensory dysfunctions.

Let me say that these were all recognized as decompression sickness and appropriate therapy was taken in a hyperbaric chamber.

I can't help but speculate at the number of cases that weren't recognized and simply passed off as bursitis or mild sunstroke.

How much time is necessary for equilibrium in all tissues in order to minimize the dangers of decompression sickness?

Studies have been done mainly with dogs where by scientists have exposed these animals to various hyperbaric (diving) conditions and then to hypobaric conditions (flying) and measured time required at surface to prevent symptoms. From these studies guide lines have been extrapolated for human exposures. What all the figures boil down to this general rule.

> "All personnel who have engaged in compressed air diving to depths of 25 ft of water or its equivalent, should not fly in other than pressurized commercial aircraft or to a cabin altitude greater than 8000 ft or its equivalent within 12 hours following the termination of a compressed air dive". (Detailed restrictions are contained in CFAO 34-35).

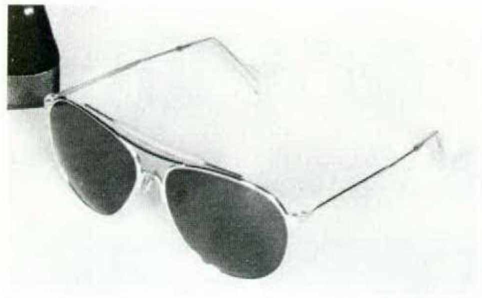
Enjoy the sea and scuba diving but give yourself a break before climbing back into the sky.

What's it called — VORTEX RING?

by Capt W. R. Reinhart

Here we are on final for landing, its been a long day, a lot of missions. We're a bit hot but I'll get it in, no sweat — always do! Sure will be nice to relax at home after being on the road for a week! High and a bit close in — that's O.K. — just flare off some speed. Hey, 20Kts and decreasing! Drop the collective and get her down a bit faster — don't worry about the heat and density altitude. We're a bit heavy but there's plenty of power to hover here anywhere. Just a bit slower and we'll hit the button — HOLD ON A MINUTE!!!

This is starting to sound like a text-book I read a long time ago, the "what-not-to-do" parts. Best pick up some airspeed and fly out of this, go around and shoot the approach properly this time. Wonder what the rest of the crew are thinking — they've never seen me miss a routine landing like this before? WHEW, I just might have been close to, what's that called, "vortex ring", or something? Let's see, low airspeed, good rate of descent, some power on, yep, that's "settling with power". Now, heavy, high density altitude, indicated speed 0-15Kts, increased rate of descent with increase in collective, airframe shaking and sloppy controls; thats power settling or "vortex ring state". Say, its all coming back now! Bet I was a bit close to it back there on final. I knew it wasn't a good approach at 200 feet — but I pressed on. Stupid! Lucky I still had altitude to dive and pick up some airspeed to fly out of it because I sure didn't have enough air to autorotate out of it. I think I'll just call up the UFSO and discuss this little problem. Maybe he'll dig out the July/August 1973 Flight Comment and the January 1978 USAF Aerospace Safety magazine both of which explain in detail the "vortex ring state". Seems to me the unit should have a bit of a discussion on this at a morning briefing or flight safety meeting. After all, didn't the USN just lose a UH-1N in conditions which sounded like "vortex ring"? Sure makes a guy wonder!



type I

type II

type III

cont'd from page 17

ments outlined in this article must be carefully selected. The position of the Surgeon General on the issue of sunglasses is reflected in the policy dealing with the entitlement for sunglasses, now issued or available as type I, type II and type III (see photographs). The scale of issue is determined as follows. Type I (aircrew sunglasses) are unpolarized to prevent the possibility of the cross-polarization referred to above. Since these sunglasses are considerably more expensive than the other types, their scale of issue is limited to those aircrew trades whose duty requires them to spend considerable time looking through aircraft windows. These trades include pilot, navigator, flight engineer, observer, helicopter reconnaisance observer and rescue specialists. Other personnel who require sunglasses because of the nature of their work (eg. soldiers in the Arctic) are issued the type II sunglasses. This type has a cellulose acetate lens mounted in a sturdy frame suitable to withstand the abuse of rigorous activity. The new type III sunglasses are not scaled for issue. Rather they are a commercial (polarized) model made available through the Canadian Forces Supply System on a cost recoverable basis. This type has been accepted as the only type to be worn with the Canadian Forces uniform (with the exception of prescription lenses).

We do not fully understand the human eye and brain and it has not been the purpose of this article to discuss the psychology or even the physiology of seeing. The perception of objects involves many sources of information well beyond the visible light stimulus entering the eye when we look at an object. It requires prior knowledge of the object and possibly involves the senses of touch, taste, smell and perhaps temperature and pain. Perception is in short, a dynamic searching for the best interpretation of available data. Sometimes the eye and brain draw the wrong conclusion and illusions result; a wrong perceptual hypothesis. A word of advice: (1) never wear dark lenses during twilight, inside buildings, or at night, and (2) never look directly at the sun, high luster reflections or incandescent lamps while wearing dark lenses. Partial blindness and possible injury may result. In this article we have dealt only with protection of the eye against high intensity light and it appears that a given task can best be performed under those adverse circumstances when observed through a dark glass.

Comments
to the editor

Dear Editor

I particularly enjoyed Maj Ron Goede's article "Backache In Helicopter Pilots" in Edition 4, 1977. However, I believe the problem he describes is far wider than just in helicopters.

As a jet pilot, I accepted the requirement for my "bang" seat to be hard, and I tolerated the discomfort knowing that the flight would not last longer than about three hours. When I converted to long-range aircraft, however, I was appalled by the "park benches" provided. Some aircraft seats did have padding, and some were fully articulating; none recognized the shape of the human spine.

Although many automobile seats have lumbar support built in, and some even have movable support to customize the position of the lumbar pad, aircraft seats continue to be made like park benches. Human engineering seems to go into the designs of everything in the cockpit, except the seats of non-jet aircraft.

Argus aircrew for years have suffered lower back problems from the long maritime patrols, but no remedy has been forthcoming. The lumbar pad described by Maj Goede would appear to be one solution which could be used to alleviate this kind of discomfort (and possible permanent injury). Probably other aircraft in the Canadian Forces could use this type of pad as well.

Will DCIEM or some other agency be addressing this problem Forces-wide? The solution sounds too good to be ignored.

Yours sincerely,

Lieutenant-Colonel E.I. Patrick, CD
404 Maritime Training Squadron
Canadian Forces Base Greenwood

Comments

Traditionally, departing Flight Comment Editor's are given the opportunity of firing a "Parting Shot" either at or to the readership — depending upon the respective views of the "Fire's" and the "Fireies". It is my good fortune to be writing this from 419 Squadron, CFB Cold Lake, birth-place of Canadian Fighter Pilots in a professional sense — and the posting I dreamed of while flying my desk in Ottawa.

Editing Flight Comment, oft times to be equated with writing Flight Comment, is an unusual assignment which offers great frustration and at the same time, occasionally great satisfaction.

My greatest satisfaction came in seeing an article entitled "You Bet Your Life", which I co-authored with Dr. M.D. "Don" Williams of Kitchener, Ontario, who happens to be my father — published in 25 different Flight Safety periodicals, in 18 different nations and 11 different languages at latest count — and in having this article specifically referred to in my father's Order of Canada citation. This was particularly fitting because he in fact provided the story line for all of my articles — beginning almost a decade ago with "The Devil at Six O'clock" which also achieved world wide publication.

The greatest frustration came in seeing Canadian Flyers continue to die needlessly — despite my best efforts to convince them that they themselves represented their own — and only temporal — salvation. But even here a certain satisfaction is creeping onto the scene with the impending re-organization at the Directorate of Flight Safety which will attempt at long last to address the problem of the "Human Factor".

If I may para-phrase, "airplanes don't kill people — people kill people!". Think it over and you'll have to agree.

The new Editor of Flight Comment is Captain AB Lamoureux — a highly experienced pilot and flight safety officer. AB has just completed a Civil Engineering degree at RMC and will, with his impressive communicative skills, be an asset to DFS. I know that he too will be engaged in a perpetual search for material and therefore I solicit your aid to him in advance.

To all those who helped me in creating 16 Editions of Flight Comment, my personal thanks! To John Dubord, our incomparable artist whose work has graced our covers and illuminated countless articles for 24 years, to Dianne Beaudoin our office manager who typed every word at least five times, due to the nature of her job, to the personnel of the Canadian Forces Photo Unit at Rockcliffe who provided outstanding support uncomplainingly for three and a half years, and most of all to Colonel R.D. (Joe) Schultz, the epitome of dedication and service in the quest for flight safety, my eternal gratitude!

Flight Comment has gradually grown to become one of the best Flight Safety periodicals in the world. In years to come it will doubtless grow and improve even more.

If it saves just one life — be it through presenting a new idea, rehashing an old one, or repeating for the umpteenth time the "Gospel according to DFS", it will all have been worthwhile a thousand times over. If it doesn't — at least I tried. *Did you*?

John D. Williams, Captain

NATIONAL DEFENCE HEADQUARTERS
DIRECTORATE OF FLIGHT SAFETY

COL J.R. CHISHOLM
DIRECTOR OF FLIGHT SAFETY

MAJ D.H. GREGORY
Education and analysis

L. COL R.A. HOLDEN
Investigation and prevention

Editor — Capt John D. Williams
Graphic Design — Mr. John Dubord
Art & Layout — DDDS 7 Graphic Arts
Office Manager — Mrs. D. M. Beaudoin

Flight Comment is produced by the NDHQ Directorate of Flight Safety. The contents do not necessarily reflect official policy and unless otherwise stated should not be construed as regulations, orders or directives. Contributions, comments and criticism are welcome; the promotion of flight safety is best served by disseminating ideas and on-the-job experience. Send submissions to: Editor, Flight Comment, NDHQ/DFS, Ottawa, Ontario, K1A 0K2. Telephone: Area Code (613) 995-7037.

Subscription orders should be directed to:
Publishing Centre,
Supply and Services Canada,
Ottawa, Ontario.
K1A 0S9.

Annual subscription rate is $7.50 for Canada, single issue $1.50 and $9.00 for other countries, single issue $1.80. Remittance should be made payable to the Receiver General of Canada.

ISSN 0015-3702

Being in the Canadian Forces can be very frustrating. It can also be very satisfying, but my concern is with frustration and how we react to it. Many people are truly concerned about some of our manpower and equipment problems and are frustrated by our apparent inability to resolve them. Others are personnally frustrated by things such as lack of career progression, working conditions, heavy workload and family pressures induced by the demands of service life. Some people react to frustration by trying even harder to overcome or compensate for problems while others allow it to affect their work. Frustration is just another type of stress which we must all learn to live with. Otherwise, you are a hazard to yourself and to those you work with. In a flying operation the results could be catastrophic.

Flight safety is very frustrating business as well. For instance, knowing that some of our recent air and ground accidents were unnecessary and preventable frustrates everyone concerned. The simple answer in many cases is that the people involved were not safety conscious. Were their attitudes affected by frustration? Whether the frustrations are real or imagined you can't afford to let them get the upper hand. If they do, perhaps you are in the wrong business.

COL. J.R. CHISHOLM
DIRECTOR OF FLIGHT SAFETY

Il peut être très frustrant de servir dans les Forces Canadiennes. Par contre, même si on peut en retirer beaucoup de satisfaction, je ne traiterai ici que de la frustration et des réactions qu'elle entraine. Nombreux sont ceux qui s'inquiètent au sujet de certains problèmes posés par la main d'oeuvre et l'équipement et se sentent frustrés par notre apparente incapacité à les résoudre. D'autres se sentent frustrés sur un plan personnel par des facteurs tel le manque de possibilité d'avancement, les conditions de travail, et les pressions familiales due à la sujétion du service. Certains combattent cette frustration en essayant de passer outre ou de compenser les problèmes qui en sont la cause, alors que d'autres se laissent aller. La frustration n'est jamais qu'un type de "stress" avec lequel il faut apprendre à vivre, sinon on est un danger pour soi ou pour ceux avec qui l'on travaille. En aviation les conséquences peuvent être catastrophiques.

La sécurité des vols est un travail tout aussi frustrant. Par exemple, quelques uns des récents accidents — qu'il soient aériens ou au sol frustent tout le personnel concerné, car ils étaient évitables et inutiles. Dans beaucoup de cas la clef du problème est simple: les personnes concernées ne pensaient pas en terme de sécurité; doit on se demander si leur comportement était affecté par la frustration? Qu'elle soit réelle ou imaginaire, vous ne pouvez vous permettre de lui laisser prendre le dessus. Si c'est le cas, alors changez de métier!

COL. J.R. CHISHOLM
DIRECTEUR DE LA SÉCURITÉ DU VOL