

View of mile-high Andean peaks, taken from Panagra airliner, already at an altitude of more than two miles.

RHUMBA RUN

By BRADLEY YOUNG

EDITORIAL NOTE: The October issue presents the second instalment of *Rhumba Run*, by Bradley Young. The first instalment was printed in the previous issue of *Engineering and Science*.

TROUBLE

The impetus gained in the Chaco carried the company on up until 1936. It was at this time that trouble began to develop, not only in *Lab* but in other South American concerns with large German elements. Pro-Nazi and anti-Nazi began pulling and hauling against each other. These people were pure German colonists and not refugees, for the influx of the latter had not yet started. In La Paz and other Bolivian towns the German concerns were about equally divided with a predominance if any of anti-Nazi feeling. In Cochabamba, the German Club was split with the majority anti-Nazi. *Lab*, with the exception of Schroth, was the same way. Schroth, not interested in Nazi politics, was pro-Schroth to the complete exclusion of everything else.

By 1938 the Nazi plan for the South American airlines in their control began to become quite clear. Lines that had been started in the various countries as isolated organizations were to be linked into a great network covering the continent. It was to be possible to go from Cartagena to Santiago, from Lima to Rio on the German lines. *Lab*, Condor in Brazil, *Sedta* in Ecuador, *Scadta*, and the new Lufthansa in Peru were all to have their part. In Peruvian Lufthansa, the last German airline to be formed in South America, the Nazis even abandoned their former pretext of giving the company a Latin name. The planes flew openly with swastikas painted on their sides. Now, with the weather permitting, a person could

leave Lima on Tuesday morning and arrive in Frankfurt-am-Main the following Sunday, following a route that included La Paz, Rio, Natal, and the South Atlantic. The Nazis were just about to carry out the final linking-up of their network in early 1940 when the going got tough.

Most of their South American flying was being done with the Junkers JU-52, the tri-motor that operated so successfully as a paratroop carrier in Norway, Greece, Holland, and other invasion spots. This was and still is a real airplane, an efficient and sturdy aerial work horse turned out by the Germans in greater numbers than any other plane ever built. No airplane, however, is any better than the supply of spare parts necessary for its upkeep. Even if the German High Command were willing to release these parts, as they no doubt were, their shipment to South America was becoming a virtual impossibility. *Lab* was in a better position than most with regard to airplane spares, having large overstocks that Schroth had purchased to get his usual commission. Engine spares were another story. Schroth, with a technical education that enabled him to judge good machinery from bad and a pilot's respect for his own neck, had consistently refused to use German engines. He chose instead those good old New England Pratt and Whitney Wasps and Hornets. These motors to all external appearances had exact duplicates in the engines put out under Pratt and Whitney License by the Benz Motorwerke. Appearance was the only point in common. Material, manufacturing precision, and the resulting reliability of the German copies were poor. All the time it was becoming more difficult to obtain United States export permits on needed engine parts. Obtaining aviation fuel became another nightmare. South American, Canadian, and United States firms were not so willing

to release large quantities of high octane gasoline and the aircraft engines would not operate successfully on anything less. This was one of the things that caused *Sedta* to suspend their Ecuadorean services early in 1941 after some sad experiences in attempting to use automotive gasoline. Air France had ceased operating between Buenos Aires and Santiago, Chile, after the French armistice a year earlier. German control of *Scadta* in Colombia had been done away with some time before. By the time the South American Fall season came around in May of 1941 things really began to happen. The Bolivian Government in carrying out an investigation of *Lab* found the company had not lived up to their managerial agreement. They terminated the company's contract and appointed a governmental committee to take over. Schroth was called to the carpet at La Paz. It was found that commissions received on parts ordered by himself were not the only advantage he had taken of his position and the company. There was a little matter of hardwood hauled in free by plane from Santa Cruz, and the use of company labor and trucks on a house building job.

About the time of the Bolivian investigations the United States Congress passed bill number HR 4674. This broadened the powers of the Federal Loan Administration to the point where they could financially aid South American republics seeking to nationalize their Axis-controlled airlines. The Bolivian Government promptly took advantage of this, and in June a three-way agreement was made between the Government, *Lab*, and the Federal Loan Administration. Among other things this agreement made it possible for *Lab* to obtain a consid-

erable amount of badly needed working capital and some modern transport planes of United States design. *Lab* also secured the services of Pan American-Grace Airways in an advisory capacity. *Panagra* was granted the authority to extend its line from La Paz on to Corumbá, joining *Panair do Brasil* at that point. This was the Rhumba Run.

In July Axis boats were sunk and burned by their crews in ports throughout the Americas. In Peru two were scuttled at Callao. To the north in Paita one was burned. On the same day that these three boats went to Davy Jones' locker, various German diplomatic envoys to Peru took off in a Lufthansa Junkers from Lima and were gone all day. Whether they were scouting Peruvian cruisers, directing Nazi submarines or just up for the ride no one knew. At any rate the flight was an unscheduled one over proscribed territory and certainly not in the realm of commercial air transportation. To the Peruvians this was the last straw. Lufthansa was promptly grounded, its planes taken into custody, and its buildings vacated, and placed under armed guard. In Ecuador the spasmodically operated *Sedta* closed completely. The next few months saw the total eclipse of Axis airlines in South America.

FUTURE POSSIBILITIES

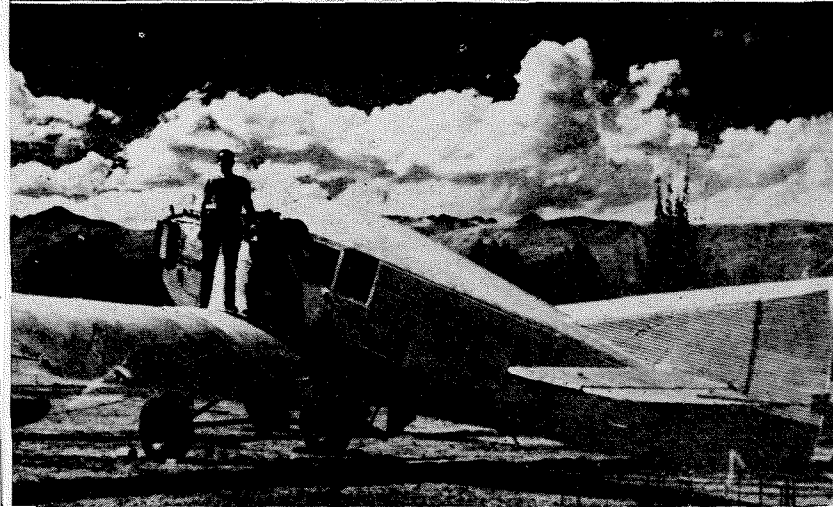
This first big step, nationalization of the airlines and ousting Nazi control, is only the beginning of the problem. Nowhere is this more true than in Bolivia. Here air transportation has opened and can continue to open new ground. In order to do this and survive, the airline must continually seek new commodities to haul and new



Rhumba Run passes over the ruins of Tiwanaco, birthplace of western civilization.

AT LEFT:

UPPER: Junkers 88 at Cochabamba. CENTER: Loading for take-off at airport of Lloyd Aero Boliviano. LOWER: The Beni Junkers 13.



seem to be the shipment of beer in cans or other cheap lightweight containers. The revenue traffic need not be all one way. Now, as never before, the Allied Nations need rubber. The grade known as hard fine Pará that brings 45 cents a pound in New York from those lucky persons with a high enough priority to buy it, sells for 30 cents a pound in Cobija.

SUPPLY PROBLEMS

These opportunities that make an airline so desirable to Bolivia exist in part due to the geographical barriers that hinder surface transportation. As such, the opportunities bring their own difficulties. Lack of surface transportation for very heavy goods is the purchasing agent's nightmare. Consider the little matter of gasoline. High octane gas for the western part of Bolivia is made in refineries at Talara, a Pacific port on the north coast of Peru. From Talara south to Mollendo it is carried by boat, then trans-shipped by rail to the high shores of Lake Titicaca. Here it is put on a steamer for the lake crossing to Guaqui on the Bolivian side. From Guaqui the gasoline rides the rails again to La Paz, Oruro, Cochabamba, and other Altiplano way points.

For eastern Bolivia gasoline moves out of Montevideo on the Atlantic, up the River Plate past Buenos Aires, and into the Paraná. It is a long pull up the Paraná to Corrientes where the smaller Paraguay branches off. This is not the last lap though, for the fuel must be pushed 600 miles further upstream to Corumbá. At Corumbá trucks drive hub deep into the waters of the Paraguay, unloading the gas drums from river boats grounded on the mud. Corumbá is the jumping-off place for wagons that haul the fuel across the Brazilian border and into the Bolivian interior. It sounds, and is difficult.

The problem of moving gasoline into the eastern and western sections of the country is trifling compared to the problem of supplying northern Bolivia. Moving gas to Trinidad serves as a good example. The scant 200 miles that separate Trinidad from Cochabamba and the fuel brought in from Peru might as well be 10,000. Fuel destined for Trinidad is loaded on board ship at New York harbor docks. The 3400 mile haul between New York and Pará at the mouth of the Amazon is the easiest part of the trip. Loaded on the decks of river steamers the gasoline starts up the Amazon and finally arrives at Manáos. This famous town of the old World War I rubber days is as far as the large boats go. Here the gasoline is transferred to smaller craft. After coming back down the Amazon 75 miles the boats turn south into the Madeira. From the mouth of the Madeira to Porto Velho is a tortuous 800 miles further into the jungle. This last point is the head of the most fantastic set of tracks any engineer ever had the nerve to lay and call a railroad. There is a sad claim made that it cost the life of a man for every tie. This probably comes closer to being a statement of bald conservative fact than anyone would care to admit. From Porto Velho the fuel goes over these tracks to Guajará-Mirim and then back again to the decks of other still smaller river boats that ply the Rio Mamoré. Their cargoes are an odd assortment of merchandise. Piles of Brazil nuts are loaded on board with coal scoops from mounds along the river bank. They ride next to crates of graniteware

markets to haul them to. Surely the possibilities are interesting enough. Fresh meat in Cochabamba is 10 Bolivianos a kilo, approximately 10 cents a pound. In Trinidad a scant 200 miles away the price is three cents a pound. Such a price is no great incentive for the Trinidad farmer to raise many cattle. With a large market he would raise more. This would mean more money to buy the hundred things he wants available only in La Paz and Cochabamba.

The Bolivian likes his beer. The bottle he buys in La Paz for four Bolivianos 30 costs 20 Bolivianos in Cobija. About half the weight of a three-pound bottle of beer lies in the bottle itself. This doesn't make for economical air transportation. As a consequence, any bottle that goes into Cobija stays there. A curb of beer bottles surrounding a house is a mark of distinction. This is rightfully so, for any person who can afford to drink enough beer at 20 Bolivianos a bottle to surround himself with the empty glassware is a person of no little wealth and prestige. A solution here would

washbasins from Chicago. Next to the washbasins are stowed cases of black Brazilian cigars and machetes from Collinsville, Connecticut. The abilities of the crews are as diversified as the goods they handle. The captain of one of the boats is a grinning Brazilian who worked at Hog Island in 1918. He loves to spread his English. It is a Portuguese-modulated Brooklynese slang of 20 years back and funny as hell.

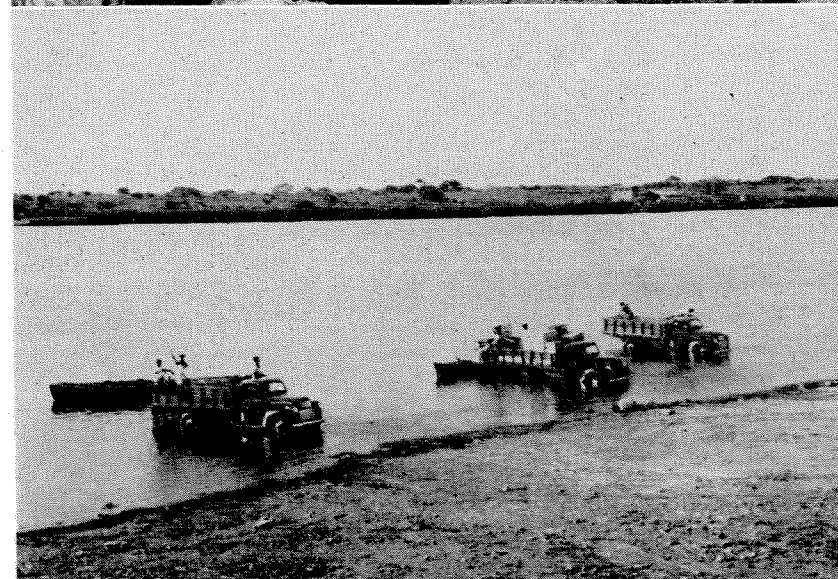
The trip of the now well-battered drums upstream on the Mamoré is a slow one. The river winds in great coiling loops, nearly doubling upon itself in countless places. At these spots it is frequently possible to cross on foot in 20 minutes a neck of land separating two sections of the river that are four hours apart by boat. One of the most unfortunate features of the entire route is the fact that Trinidad does not lie directly on the Mamoré. The fuel is off-loaded from the boats at La Loma or Puerto Almacen. From here the last haul must be made in ox-carts. Gasoline arrives in Trinidad 6000 miles and six months away from New York's East River piers.

The final needle is this: with due allowance for delays due to torpedoed freighters, customs red tape, river boats aground, and just plain delays, the shipments must be scheduled to arrive at their last stage during three specific months of the year. These months comprise Trinidad's alleged dry season. Missing them may mean a fuel shortage for the remaining nine months of the year until the trail dries up again. The consequences of such a shortage are too sad even to think about.

PILOTS' HEADACHES

The purchasing agent isn't the only one with troubles. The pilot has his too, mostly made by the Andes, the jungle, and the weather. Last September, Sam Park, veteran United States pilot, ferried *Lab's* second Lockheed Lodestar obtained under the reorganization plan from the States to Bolivia. A month later he again flew down over the same route with another Lodestar. With him came Ernie Gann, pilot on leave from Eastern Airlines. Gann, naturally curious about the ground he was to fly over, asked Park beforehand what the route was like. Sam promptly informed him that the land was indescribable, that he would have to wait and see. Upon their arrival in Cochabamba Ernie remarked: "Well, we're here—I've seen it—but I still don't believe it. We flew over *Lost Horizons* without the *Shangri La*." This reaction is always a surprise to the local *Lab* pilots who have never flown anywhere else.

One of these boys is Luis Torres, a tall, Latin, young Bolivian of unfailing good nature and excellent natural



AT RIGHT:

VIEW 1: The airport stationwagon at Riberalta waits to serve passengers from a South American plane. **VIEW 2:** Way-point passengers on the Rhumba Run may reach their ultimate destination by a llama train on the Altiplano. **VIEWS 3 AND 4:** Gasoline is more precious than diamonds on the Rhumba Run. Aviation gasoline must be high octane, which for the eastern part of Bolivia is made on the north coast of Peru, from whence it is carried by boat and trans-shipped by rail to the high shores of Lake Titicaca. Here it is put on steamer for the lake crossing to Guaqui on the Bolivian side. From Guaqui the gasoline again rides the rails to La Paz, Cochabamba, and other Altiplano way points.

flying ability. One day in the course of a rather rambling conversation the author happened to mention that United States domestic airline pilots didn't generally consider terrain runs as being among their easier flying assignments. Luis questioned the unfamiliar use of the word "terrain," and was informed that it applied to a route spanning rough or mountainous country. Still somewhat mystified he remarked that he had always thought of the United States as being nearly flat and therefore probably a very dull place to fly over. When pressed further, the author finally had to admit that a route over the Appalachians of not more than 7,000 feet might be classed as terrain. The ensuing laughter was certainly prodigious. Luis has lived most of his life at an altitude above 8,000 feet. He spends a great part of his flying time over country much higher and more rugged than the Appalachians. Typical of this mountain country is the terrain around the *Nudo* of Apolobamba. The *Nudo* is a great confused knot of lofty intersecting spur ranges and deep *quebradas* or canyons that lie along the line between La Paz and Apolo. In this area are at least 50 peaks topping Mount Whitney, highest in the United States. It would be possible to sweep the entire Alps into the *quebradas* of this region like so much dirt into a floor crack, and with scarcely more remaining evidence once the job were completed. The weather around the *Nudo* is something to contend with, too. During the winter season it is a region filled with what the airman terms hard center clouds. A hard center cloud is any cloud with a mountain peak deceptively wrapped up and hidden within it.

Even if the western section of Bolivia were as level as a billiard table, its altitude would still have a vital effect on *Lab's* planes. An airplane depends upon the density of the air for its support; the power of its engines is strongly affected by this same factor. At an airport such as La Paz on a warm day the air density will drop to only 70 per cent of what it is at sea level. An airplane that jumps from a sea level airport like a frightened flea may not be able to more than stagger off the ground at La Paz. A few years back one wise-guy pilot tried to fly from Arica to La Paz and return in a small light plane inadequate for the purpose. The trip going up was fine. He rode back in a chair car, his plane loaded on a coal gondola behind.

Not long ago the same Luis Torres previously mentioned made what was without doubt one of the most difficult take-offs ever attempted from a location considerably higher than the La Paz airport which lies at 13,400 feet. The place was the Pampa of Chilligua, 15,000 tapeline feet above sea level. With the high air temperature involved the "density" altitude topped 19,000 feet, higher than most airplanes ever fly. To make the problem doubly difficult, the plane was a Grumman amphibian. The comparatively unstreamlined amphibian, having both a hull seaworthy enough to withstand the shock of water landings and a retractable undercarriage to permit land operations, is an airplane of definite and obvious advantages for certain types of service. These advantages are inexorably paid for by a slower climbing ability, lower payload, and inferior take-off performance as compared to a single purpose airplane of the same size. Mr. Grumman's amphibian as turned out in his Long Island plant is a very nice airplane. It is a safe bet though that he never planned it for take-offs at 19,000 feet. Nobody ever designed any airplane, amphibian or otherwise, to meet that kind of requirement. Standing by the Grumman at Chilligua, the air so thin that breathing alone was a real effort, the author could

not help but think of a remark he once heard an airplane pilot make at Albuquerque, New Mexico. The pilot was preparing to lift his DC-3 transport from more than a mile of surfaced runway. He said he never liked to take off from Albuquerque, it was too high. Albuquerque is a bare 8,000 feet above sea level. Torres plowed up three miles of soft sand before he boot-strapped the Grumman into the air at Chilligua. His take-off run took so long it could almost have been timed with an alarm clock.

JUNGLE TROUBLES

On the Altiplano the airport runways have to be long. Most of these, built on salt flats or other dry level ground, are relatively easy to construct. It is a good thing that all Bolivian airports don't take quite so much room, particularly in the northern and eastern sections. Whacking an airport out of low and swampy jungle country isn't a particularly easy or joyful job. Getting dump trucks, graders, and the big caterpillars to pull them in on the airport sites is a tough piece of work in the first place. It is nothing, though, compared to the task of keeping them going in the sticky red mire that must be cleared, leveled, and drained to make a decent field. The Nazis, during their regime, didn't do much more than the absolute minimum required to accommodate the slow flying and short landing characteristics of "Die gute Tante Ju." Even then they had more than a normal quota of nosed up landings, marcelled propeller tips, and the grief that an airport too short on one end can bring. The advent of heavier modern planes with faster landing speeds such as the Lockheed Lodestar and Douglas DC-3 made field extensions mandatory.

A number of survey flights were made on the Rhumba Run with the new equipment before starting regular service, and prior to the extension of the airports. After one of these, Frank Achilles, a *Panagra* pilot, came back to Lima firmly declaring he had found the only sure way of getting a DC-3 into the field at San Jose. His formula ran as follows: "Get the flaps and gear down, then try to take the top off of the Mission tower. If you miss the tower, aim the wheels at the runway fence. But mister, if you miss that fence pour on the coal and come around again, because you've overshot."

Sometimes the American concerns that furnish equipment and materials for the airport extension work aren't any too understanding of the problems involved. At Concepción some trouble was met in clearing out nests made by driver ants. These ants, which at times travel in armies a hundred yards wide and many times as long, are extremely vicious. In the space of a few hours they can take the hide and flesh of a full grown wild ox down to bare polished bones. Their nests are three-foot mounds of clay laboriously deposited pellet upon pellet. Something in the secretion used by the ants to moisten their building clay makes these pillars almost rock hard. They could as easily rip a wheel from a landing airplane as could a concrete post. In looking for something to destroy the ants it was decided to try a certain disinfectant company, a United States concern advertising themselves as one of the oldest, largest, and most experienced makers of insecticides in the business. One afternoon some three months later a crew flew into Concepción with the anxiously awaited remedy on board. After the usual scramble for the mail, this package was opened. Its contents consisted of a dozen small squat glass jars of ant paste, fitted with covers perforated like a salt shaker. No self-respecting driver ant could even get a mandible through

(Continued on Page 15)

and partly blocked roads. Operators must be relieved, rested and fed. To accomplish these things, supply stations must be maintained and stocked with essential supplies and materials. Minor repairs, such as replacement of damaged motor blades, are ordinarily made where they happen, but when more extensive repairs are called for, a heated building is required. It is disagreeable enough to make repairs, but when the patient is encased in several inches of frozen snow and ice, it is a discouraging prospect.

Well-constructed, heated, operating compartments on equipment are not only desirable but essential for effective work. In some cases, they constitute the minimum of safety for personnel. In the heavier types of work, at least two men should be assigned to each operation, and, in general, should not separate during the period of storm. There have been cases where near fatalities occurred because one member of a crew attempted to "walk out" when equipment stalled.

The need for well trained, energetic men in snow removal operations is of primary importance. The entire operation appears simple while the sun shines and the ground is bare, but when the fight is on, an inexperienced operator soon becomes a liability, and, in addition to being a hazard to himself and fellow-employees, may cause actual physical damage to the road structure. A case to illustrate this fact was brought about by the plowing of a single roadway in mountainous country during a three foot fall, which created a sluice-way, down which melted snow, water and ice rushed to form an ice jam, which, in turn, diverted the flow over an embankment, and resulted in several thousand dollars' damage which might have been prevented if precautions had been taken.

Snow is an asset to this warm, desirable climate if, like most assets, it is handled with care and understanding. From the viewpoint of purely physical enjoyment, what is more pleasing and invigorating than a drive through the frosty, snow-covered mountains into the summery climate of the valleys below? There are many who have experienced this pleasure and there are many who look forward to it when peace comes again. If you enjoy the ride, just remember that someone has probably toiled through the chilly night to make it possible.

Rhumba Run

(Continued from Page 12)

one of these holes, much less crawl through and eat his fill. The engineer in charge, a man whose temper has been shortened by 20 years of such trials in South America's out sections, took just one look. With an acrid Spanish oath he ripped the cover from a single can. A driver ant, too long to go in any other way, was curled up and deposited inside. This can with the cover replaced was air-expressed back to the manufacturer by the same plane it arrived on.

Much of the airport work is done by Indians. They vary in type and appearance as much as Bolivia's geography. All along the Cordillera are the copper-skinned Quechuas and Ayamarás. An almost pure race, these people still speak no Spanish, only the tongue of their Pre-Incaic forebears. Heavy boned, with enormous chest development and apparently no feeling of cold, they are well adapted to their high environment. The Indians in the low regions are much more primitive. Printed across one jungle portion of the excellent map compiled by the

Bolivian Cartographic Commission are the words *Gentios Salvajes*. This means Savage People. Whether these people are really savage or not is a common conversational topic. The consensus is generally with the "nots." But at least they have the equipment for making any unwanted visitor exceedingly unhappy should they choose to do so. No archer from Robin Hood to Ralph Hoogerhyde ever dreamed up a siege gun of the sort these boys use. The author has in his possession a number of *Gentio Salvaje* arrows and a bow. The arrows are 11 feet long, longer than an Olympic Games javelin and somewhat more vicious, being sharply barbed over the first 15 inches of the business end. The bow is a section of dense black-palm only a little less stiff than a piano leg. It is strung with a raw-hide thong as thick as a piece of sash cord. The bowman sits on the ground, places this little number across both feet, and hauls back the bow string with both hands.

Fortunately the chances of a Rhumba Run passenger ever finding out first hand if these people are savage or not is very remote. In the first place the route does not cross the area that is their usual habitat. In the second place the people setting up the methods of operation have been more conservative than a bunch of Coolidge era Republicans. All the planes are multi-motored craft capable of flying with one engine dead. They carry a separate radio operator which permits the taking of constant position checks by radio bearings and gives the first officer more time to spend on straight navigation. Gasoline loads are high. On the Rhumba Run enough fuel is carried not only to permit the pilot to reach an alternate airport in bad weather, but to return to his point of departure should he so desire. As additional trouble insurance in the event of a forced landing at some place in the wilds, the planes carry a bewildering assortment of equipment never seen on more domestic airlines. A list of these items looks like the inventory of an Army-Navy department store. They range from a shotgun and machete to a two-quart pot for cooking beans. Fish hooks, bait, and a Boy Scout knife are only three more items in a list of 50. A separate medical kit contains everything from benzedrine to a bottle of Haig and Haig. There probably never will be a fool-proof airplane so long as human beings build and fly them. Anyhow, it doesn't hurt to push the chance for trouble right out to the last limit of probability.

In spite of all obstacles such as hard center clouds, altitude airports, ants, and an ox-cart fuel supply in places, the Bolivians have a goal worth the long haul their airline development will take. One day the natural resources tapped and the new areas opened will prove it. Long before this happens *Lab* and the Rhumba Run may mean a great deal to many people who will never see Bolivia. The cargoes moving in and out of Latin American airports are now peaceful ones of salt, meat, sewing machines, and plowshares. When the time comes that these must be replaced by swords, soldiers, and bombs, the Americas, both North and South, will prove that they can do this, too.

FOOTBALL SCORES

The following, are the season's football scores:

Sept. 15	CIT—67	Univ. of Redlands.....	0
Sept. 22	CIT—39	Univ. of Redlands.....	0
Sept. 30	CIT—20	USC Jr. Varsity.....	0
Oct. 6	CIT—33	UCLA Jr. Varsity.....	0