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# FIRST OVER EVEREST!

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*The Houston-Mount Everest Expedition, 1933*

*By*

AIR-COMMODORE P. F. M. FELLOWES, D.S.O.,  
SQUADRON LEADER THE MARQUIS OF  
DOUGLAS AND CLYDESDALE, M.P.,  
L. V. STEWART BLACKER, O.B.E.,  
AND COLONEL P. T. ETHERTON

*FOREWORD BY JOHN BUCHAN, C.H., M.P.*

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*WITH ILLUSTRATIONS FROM PHOTOGRAPHS*

1934

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## Foreword

By JOHN BUCHAN, C.H., M.P.

I HAVE been asked by my colleagues of the Everest Flight Committee, to set out briefly in untechnical language what seem to be the major results of the expedition.

The first point to make clear is that its purpose was not to perform a feat of daring and endurance, to break a record, to do something for the first time. These are doubtless excellent things, and the expedition in fact achieved them—but it was incidentally. The true purpose was austere scientific: to show that the airplane and the air camera could be made the means of acquiring important knowledge which would otherwise be unattainable.

The second point is that for this purpose the most intricate and patient organization was required. The culminating work would occupy a very small space of time (it took actually less than six hours), but to make it possible there had to be months of labor and thought behind it. The case was parallel to that of a great battle, which may be won in half an hour, but

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where victory is the fruit of laborious preparation. It involved exploration in an unknown and inaccessible area, and therefore every care had to be taken to reduce the risks to a minimum. The technical problems, in the machines and the cameras, had to be worked out to the last decimal, and there were novel features in both which required elaborate experiments. The success of the expedition was largely determined by the months of hard work in Chelsea, Yeovil, Bristol, London and Karachi, between March 1932 and its arrival at Purnea in March 1933.

It must also be remembered that the Committee assumed grave responsibilities. The Air Council gave the project its benediction, and the trust of the Air Council had to be justified. The Government of India approved, and the Government of Nepal agreed to what was an unprecedented request. There was a heavy responsibility, too, to the patriotic lady who provided the funds, and to the flying men themselves, to see that nothing was left undone to insure safety and success. The expedition was no light-hearted escapade, but an enterprise based in every detail on the most serious thought.

To turn to the results. The first purpose was to put

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Everest and the untrodden ground south of it on the map. There could, of course, be no hope of producing a complete map of so big an area; for that many flights would have been needed. What was obtained from the two flights was a series of survey strips, based upon vertical photographs. Thus the experts were able to piece together a map strip some twenty miles long and something under two miles wide, culminating in the summit of Everest. Some of the identifications have been difficult, and some questions will remain unanswered, but it marks a notable advance in our knowledge; for the existing maps of the south side of the mountain were vague in the extreme. There is also the cinema film as a further aid to identification. The difficulty of taking photographs at such an altitude will be made clear in the following pages, but it is a great thing to have established that it is possible, and that we have a new and effective instrument for the survey of regions which cannot be traversed by the foot of man. It was not to be expected that the flights would reveal any startling new geographical features; but two glaciers, hitherto unknown, have been discovered, and a small high-level lake, which may possibly be hot water.

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In the second place, we have added considerably to our meteorological knowledge. The deductions from some of the data secured have still to be made, but it is likely that these data will be valuable in a service which is of practical importance to India. There is always a high wind over the Himalaya—on the second flight its velocity was over 120 miles an hour. Dust has been encountered in the Sudan at 15,000 feet, but in India it can be carried to 19,000 feet. Much has been learned about the down-draughts and up-currents caused by the deflection of the wind on the highest peaks.

There were some curious discoveries, too, in connection with the human physiology. Flight-Lieutenant McIntyre found that the cumbrous and elaborate apparatus of the pilot at great altitudes was largely unnecessary. If you have to protect equally every part of the body, you must have a heavy helmet, a big oxygen mask, and specially heated goggles, which means that you cannot do your work, since you cannot turn your head or look downward without disarranging the apparatus. On the second flight he used a small home-made mask, a light fabric helmet, and no goggles, and, though he climbed to 34,000 feet and left the up-



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per part of his face uncovered, he suffered no ill effects. This will probably mean a revision of high-flying equipment. Nothing was more remarkable than the good health of pilots and observers after a flight. They would strip and dive and swim in the pool at the aerodrome, which did not suggest any danger to their hearts or blood-pressures.

I have said that the expedition was not undertaken to perform a sensational feat, but for the most sober purposes. Yet the result was a very considerable feat. It was pioneering, and the most careful preparation could not rob the venture of its danger. A defect in the construction of the machines, an error of judgment or a failure of nerve on the part of the pilots, and the result would have been tragedy. Moreover, no one knew beforehand what the weather conditions at the summit of Everest might be; it was possible that there might be eddies and *tourmentes* there which would sweep any plane to destruction. The pilots and observers deserve the credit of those who with clear eyes face the perils of the unknown. They have shown once again—if it needed showing—that the post-War years have not dulled the ardor or weakened the fiber of our youth.

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While the fliers were circling round the summit of Everest before returning to all the comforts of civilization, the party of climbers were slowly creeping from camp to camp up the northeast ridge. The latter was a far more desperate venture. The fliers could choose their day and weathers, but the mountaineers, once they were in the grip of the mountain, were at the weather's mercy. That gallant enterprise had no single piece of good luck, though one of its members got to within a few hundred feet of the summit. The sympathy and admiration of the world must go out to them; for their failure was in itself a splendid achievement.

The two expeditions were typical of the old and the new, which must always coexist in the world; the one using the last discoveries of science to circumvent time and space; the other, though assisted by science, relying upon the toughness of the human frame and the power of the human limbs, which since the cave-dwellers have been the instruments of human endeavor. I am certain that there is no young man who, if he had the choice, would not prefer to stagger blind and panting onto the snow-cap of Everest rather than look down upon it from the air. But both expeditions, how-

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ever unlike in their methods, had one thing in common—the spirit of hardihood and adventure, and the members of both belong to the great community of the lovers and conquerors of the high places. Mr. Belloc has defined the creed of such as the “communing between that homing creeping part of us which loves vineyards, dances, and a slow movement among pastures, and that other part which is only properly at home in heaven.” Théophile Gautier, carried out of himself by the contemplation of the Matterhorn, has given the brotherhood its charter—“Ils sont la volonté protestant contre l’obstacle aveugle, et ils plantent sur l’inaccessible le drapeau de l’intelligence humain.”



# Chronology of the Everest Flight

- 1932: MARCH      Headquarters of flight located at College of Aeronautical Engineering, Chelsea.  
*Plan for flight to Mount Everest, submitted by L. V. S. Blacker*, considered by Council of Royal Geographical Society.
- APRIL            Letter sent to Secretary of State for India by Council of R.G.S., intimating that in their opinion the plan is likely to produce valuable scientific results.  
Air Ministry grant facilities at the Royal Aircraft Establishment, R.A.F. School of Photography, and Experimental Establishment, Martlesham.  
Negotiations with Bristol Aeroplane Company for Pegasus engine.  
Lord Peel and Colonel John Buchan join the Committee of the flight.
- MAY              Official application made to India Office for permission to fly across Nepal.  
Colonel Etherton communicates with British Envoy in Nepal, a former brother officer.

## *CHRONOLOGY OF THE EVEREST FLIGHT*

- British Envoy at Khatmandu intimates the flight is receiving sympathetic consideration from Nepalese Government.
- Arrangements made for use of Army Department's landing-ground at Purnea.
- 1932: JUNE Lord Clydesdale joins the Committee and is later nominated pilot.
- JULY Master of Semphill joins Committee.  
India Office approached to grant exemption from customs duties, to loan reserve pilot, and various other ranks of R.A.F. in India.
- Arrangements made for supply of gasoline, oil, etc.
- Special concessions accorded by P. & O. Steam Navigation Company.
- Negotiations opened with Gaumont-British Picture Corporation for filming the expedition.
- AUGUST Government of Nepal sanctions flight.
- SEPTEMBER Lady Houston approached by Lord Clydesdale to give financial support to expedition.
- Lord Lytton and Wing Commander Orlebar join Committee.
- India Office grants customs exemption.

## CHRONOLOGY OF THE EVEREST FLIGHT

- Oxygen apparatus and heated clothing selected.
- OCTOBER** Type of Pegasus engine and supercharger settled.
- Selection of Eagle cameras and accessories made.
- Westland P.V.3. airplane selected to replace earlier type chosen.
- Negotiations for personnel, material, and insurance.
- Lady Houston supports flight financially.
- Pegasus engine ordered from Bristol Aeroplane Company.
- NOVEMBER** Lord Burnham joins Committee as Honorary Treasurer.
- Air-Commodore P. F. M. Fellowes appointed chief executive officer.
- Flight-Lieut. McIntyre appointed second pilot.
- Defence Department, Irish Free State, offers to lend two suitable airplanes, free of charge, complete with Jaguar engines.
- DECEMBER** First acceptance test flight carried out at Yeovil.

## CHRONOLOGY OF THE EVEREST FLIGHT

1933: FEBRUARY Westland planes shipped to Karachi in  
*s.s. Dalgoma.*

Three Moth airplanes with executive  
officer and pilots leave London.

MARCH Westland planes unloaded at Karachi,  
India.

From Karachi by air to Purnea. Inspec-  
tion at Delhi by H.E. the Viceroy.

\*\*APRIL 3 *First flight over Mount Everest.*

APRIL 4 Flight over Kangchenjunga.

\*APRIL 19 *Second flight over Mount Everest.*



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## The Challenge of Everest!

*Dreams of Its Conquest by Air—Frustrated Attempts—The Aims of the Mount Everest-Houston Expedition—The Invulnerability of the All-Highest—Conditions on the Roof of the World—Native Explorers Reconnoiter Its Outer Defenses—The Checkmate of Abysmal Chasms—Heights More Forbidding than Their Guardians, Forbidden Tibet and Nepal*

**J**ULES VERNE, in company with other dreamers, had visions of weird aircraft, primitive helicopters and would-be steerable balloons flying over the summit of the world's highest peak. These dreams were followed more recently by the projects of actual fliers, but the overcoming of Everest from the air continued to be little more than a fantastic hope until 1932.

Tentative approaches were made, it is true. In 1925 Sir Alan Cobham flew over the neighboring mountains, but the great peaks themselves proved beyond

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the capacity of his aircraft and engines. Again, two enterprising French fliers and at least one German made plans for the supreme flight, but their ambitions were not to be fulfilled. Later still, Richard Halliburton secured the much coveted permission to cross the frontier of Nepal in his airplane, "The Flying Carpet." He flew over the lower mountains to within sight of the culminating peak; but, once again, his engine was inadequate for attaining super-Olympian heights. The prize was not destined to reward a feat of Arabian Nights' adventure.

Mt. Everest remained unconquered by air and would stay invincible, it seemed clear, until attacked by an engine of superlative power, equipped with a supercharger able to cope with atmospheric conditions on the roof of the world, close to the very stratosphere. Furthermore, common sense suggested that the subjugation of this giant depended on strategy and tactics no less thoroughly weighed than those employed in any military campaign. No haphazard hop would ever attain the true objective, that is, earn the scientific data that warranted so hazardous an undertaking and the attendant expense. Consequently, true success could not be the fruit of a solo flight. It must hinge on the

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most conscientious preparation and on the coordination of all resources, whatever their form. Nothing must be left to chance. This demanded careful organization, a technical plan well threshed out by qualified experts and the whole-hearted cooperation of trained pilots and observers, the latter skilled as surveyors and photographers. And, what is more, the stamina and resourcefulness of these men would have to be proof against the known rigors of the enterprise and equal to facing the unpredictable. These aims approximate the ideals of the Mount Everest-Houston Expedition, so named because of the bounty of its generous sponsor, Lady Houston; for a prerequisite of any attack on Mt. Everest was the support of some public-spirited patron of aviation.

Nothing which reason might anticipate should be left to chance. The soundness of this theory may be gauged by the results: both of the airplanes selected for this super-flight returned victorious, not only once but twice in April of this year 1933. Thus did the celebrated Plume of Everest become another feather in the cap of Science.

Every sovereign peak of the world, whether Kili-manjaro in Africa, Mt. McKinley in North America

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or Aconcagua in South America, Elbruz in Europe or Everest in Asia, is a challenge to the pioneering instincts of man. None quite so much so as the last, the Overlord of all mountains, which through our own generation and that of our fathers has been the symbol of remoteness and invulnerability. Perhaps it is this very fact which inspired the long series of brave struggles to attain it, struggles which became more determined and ever more gallant after man had reached both Poles and so left Everest as the last stronghold to be captured.

It is hard to do justice to the magnitude of the Himalayas and the height of its crowning peak. Perhaps some idea of the immensity, the magnetic power, of the Himalayan mountain mass may be gathered from the fact that the liquid in a spirit-level is attracted towards it to an appreciable extent. Indeed, it exerts a force similar to the moon's on the waters of the vast Indian Ocean. And this greatest of mountain ranges rises almost abruptly from the plain of India! As for the altitude of its undisputed monarch, Everest, imagine the pinnacle of a Matterhorn on the shoulders of Mont Blanc, or Mt. Rainier, the second highest peak of the United States, capped by the very highest, Mt.

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Whitney. Only from the elevation of nearly five tiers of Mt. Washingtons might one gaze down on the summit of Everest. Five and a half miles it soars into the blue, not less than the 29,002 feet with which it was credited by the observations of 1846-1849. Such is the astounding height of the mountain which overlooks the cradle of Aryan civilization.

Insuperably high, it would seem, for even at an altitude of two miles breathing grows difficult for most climbers; the heart races and limbs show signs of becoming a dead weight. With each step the cold is more bitter, the wind more relentless and the traps set by ice, snow and rock multiply on every hand. As if that were not enough, the very mind ceases to function in accustomed ways and is exposed to hallucination and terror. This being the case on even moderate Alpine heights, picture the increasing ordeal of those clinging to the roof of the world where every handicap is magnified threefold. And yet ever since the All-Highest of mountain giants was named in honor of Sir George Everest, the brilliant Surveyor-General of India who fixed its position and altitude almost a century ago, its ascension has been the dream of sportsmen and scientists.

An exploit which is a magnificent dream figuratively

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speaking, may reveal all the horrors of a nightmare when put to the practical test. Such has been the experience of every foot expedition on however elaborate a scale. Even the handful of individuals who have ventured to determine the nature and area of the base of Everest have endured incredible hardships. Abysmal chasms encircle its roots, forming an all but impassable moat. Some idea of the perils may be gleaned from conditions along the Bhotia Kosi River as reported by a surveyor mentioned below. The trail was hemmed in by precipices so menacing that the path had to be supported by iron pegs driven into the face of the rock. The path itself was formed by bars of iron and slabs of stone laid from peg to peg and covered with earth. In no place was it more than eighteen inches wide, and often barely half that width. It looked down, and still does, on a torrent which foamed 15,000 feet, nearly three miles, below. The cleft of the Grand Canyon is a mere gully by comparison.

Such is the region penetrated for the Survey of India by Hari Ram; for after the data gathered in the middle of the nineteenth century, a long period ensued which may be described as the phase of the native explorers. The Indian Governments were in a dynamic



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state. The Government of the Punjab under John Lawrence, pushed explorers far afield through the valleys of Kashmir to Imperial China and High Tartary, where the Russian Csars were not yet known; and the governments of Bengal and Hindustan sent their men in disguise into the no less forbidden kingdoms of Bhutan, Tibet, and Nepal.

One of the most famous of these intrepid men was officially known for many years as No. 9, though it now transpires that his actual name was Hari Ram. In these cases, it was far preferable, in the interests of long life, for surveyors to have a number rather than a name.

In 1871, No. 9 started in the early autumn from Darjeeling, which had for some years been a European settlement, and passing through Sikkim, at length made his way into Tibet. He anticipated that, in common with all other travellers in this direction, he would be stopped by the frontier guard and possibly tortured, and so took measures accordingly. Before crossing the frontier onto the high plateau of the vast plain of Chang Tang, he ingratiated himself with the Lepcha chief of an important district south of the frontier whose wife happened to be ill. No. 9 had provided

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himself with a stock of European medicine, and under his treatment a cure was at last effected. In consequence, the headman treated him with great kindness, of which he took advantage to press for assistance in his passage to Tibet. The headman finally consented and sent one of his own men with him.

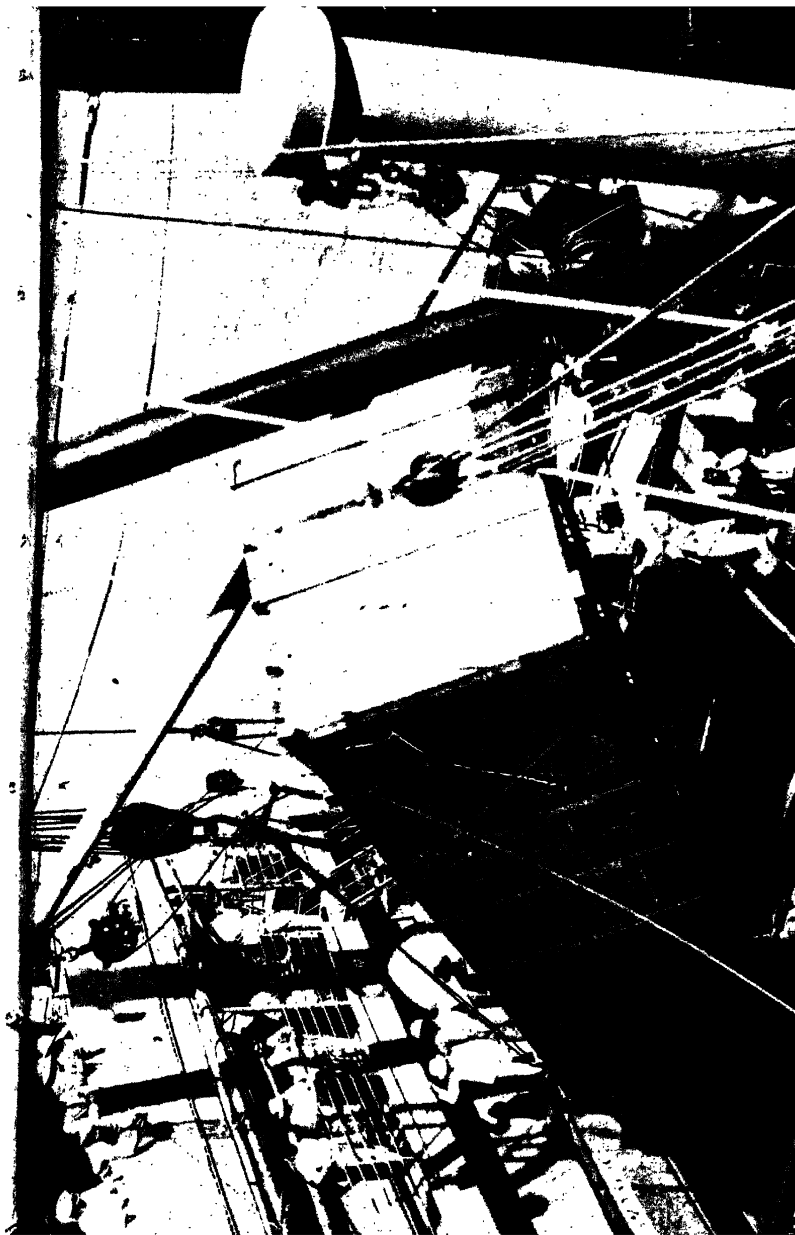
At last Hari Ram crossed the Tipta Pass, and then the Nila Pass, until finally he reached the Arun river. This is the remarkable river which bursts its way from Tibet through the main chain of the Everest range some way to the east of Makalu. Later, it joins with the Kosi of Nepal and at length reaches the Ganges.

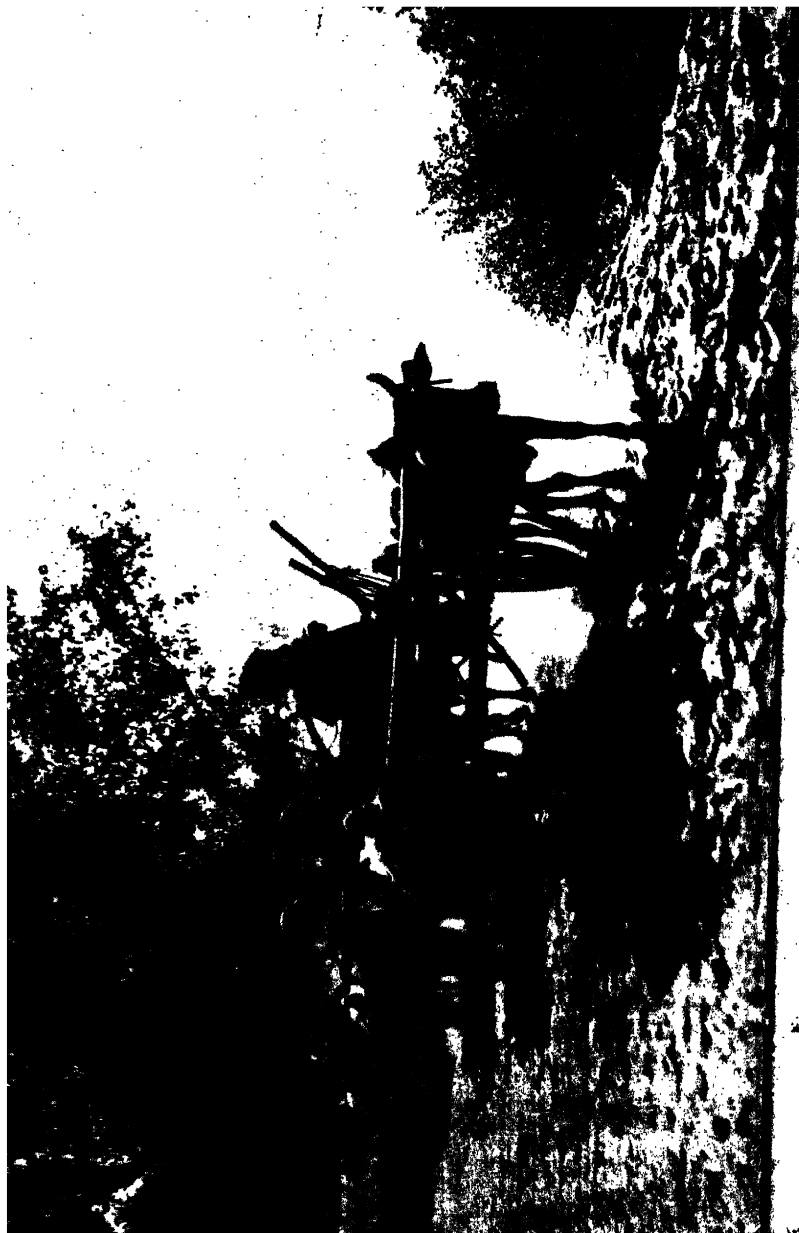
He marched on, first over the glacier ice of the Ragulong Pass, 15,200 feet; and then, struggling on, up over the ice and old-packed snow of the Thanglang Pass at 18,460 feet. Thus the first traveller in the British service won his way from north to south along the course of the Arun, the river that sixty-two years later was to serve as a landmark by which British airplanes would fly to the summit of Everest itself.

This was the character of the country on which the fliers of the Houston-Mount Everest Expedition might have to make forced landings.

### UNLOADING THE PLANES AT KARACHI

Before the expedition left for India trial flights up to an altitude of 35,000 feet were made. After that the two airplanes were dismantled and shipped to the Indian port of Karachi, where they were re-assembled and flown to the Lalbalu flight base near Purnea. Some of the expedition members went to India by steamer, others by air.





## II

### Strategy and Preliminary Tactics

*Still Twenty Miles from Everest in 1882—Lung-power is Man-power—Peak XV and a Mess-room Anecdote—Nepalese Views on Peaceful Penetration—The Russians Visit Tibet—Britain's Counter-Visit of 1904—Its Mountains Surveyed by Ryder—Everest Accepted as Earth's Supreme Peak—Its Tactical Reconnaissance in 1913*

INCREDIBLE as it may seem, up to 1882 no one with any vestige of scientific training came within striking distance of Mount Everest. The palm for this distinction goes not to Europe but to Asia in the person of a Hindu, whose name is phoneticized as Gandarsan Singh. The records are confused except on the point that he volunteered for the hazardous task and ascended the range called Popte, which is the boundary between Nepal and Tibet, a part of the massif crowned

#### IN A PRIMITIVE LAND

The road from Purnea to Lalbalu, the starting point of the great flight, is typical of the region in which the aerial navigators made their base. Bullock carts are still the principal means of transportation. In the mountainous regions their efforts are supplemented by those of human burden-bearers, both men and women, who carry surprisingly heavy loads.

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by Everest. The deduction is that he cannot have been more than twenty miles away from his goal.

Not quite as close to it came Hari Ram on a second journey into Nepal in 1885. He seems to have passed within about twenty-three miles of the mountain on the western side. He mentions stopping for a breathing-spell at Tingri Maidan, a town situated 13,860 feet above sea-level, one of the highest settlements on earth. It is from communities of this type that porters have been secured for recent ventures on foot. One may not lay too much emphasis on the need of phenomenal lung-power at such altitudes. Without it exertion is impossible. Hence the important part played by oxygen in the equipment of non-natives, the European leaders of every expedition. To climber and flier alike the oxygen mask has proved as essential to victory or survival as the gas mask in No Man's Land.

The journeys of Hari Ram and Gandarsan Singh completed what may be called the early history of the advance against the defences of Mount Everest, its obvious scarps and counterscarps. Most of its ramparts were still masked. The sequence of operations was accordingly in an early strategical stage, and it was not

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until much later that the attackers came face to face with the tactical problems of the conflict.

A lull ensued until 1904, when science unmasked a fresh battery, this time from a new and unattempted quarter—Tibet and the north. It was then that a survey party worthy of the name started out under Captain Charles H. D. Ryder, who later became Surveyor-General of India. While there is nothing to show that any of the party approached within close range of Everest, they had excellent views of it and of Makalu and other peaks, from the north. With their fine equipment and technical training they were able to achieve much of scientific value.

The one outstanding result of their labors was Captain Ryder's conviction that none of the great mountains to the north in the heart of Tibet itself was as high as Mount Everest. To him, therefore, goes the credit of establishing beyond cavil the preeminence of what up to 1852 was shown as a blank dot on a blank chart and labelled with a supreme lack of imagination Peak XV. But Ryder's verdict should not detract from the bearing or the humor of the story long current in Anglo-Indian mess-rooms. The yarn goes of how a Bengali computer rushed into Sir Andrew Waugh's

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office, crying out: "Oh, sir, oh, sir, I have discovered the highest mountain of the world!" Surely this desk-Columbus deserves a tablet somewhere.

After 1904 there is a further lapse of years when nothing definite was accomplished but during which Major (now General) C. G. Bruce was planning an organized attack upon the mountain. His intentions were repeatedly foiled by a variety of circumstances. For a number of years after the British expedition to Lhasa, while the Anglo-Russian agreement was in force, the Foreign Office did not consider it advisable for British parties to penetrate Tibet for fear of offending Russian as well as Tibetan susceptibilities. This situation persisted from the signing of the above-mentioned agreement in 1907 up to 1914, the outbreak of the Great War.

From August of that year onwards, every man likely to be of a suitable disposition to tackle Mount Everest had other fish to fry. The year 1919 marks the inception of modern attempts against the mountain, both by land and air, and was based on the findings of Captain John B. L. Noel's reconnaissance of 1913.

Came the climbing expedition of 1924 with its record of valiant endeavor, and the truly epic heroism of



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Mallory and Irving. These gallant men, last seen far, far up, making the final stage of the ascent, had victory almost within their grasp, their aim all but achieved. Perhaps it *was* achieved and on the summit they now rest—monuments to a crowning triumph.

Both Nepal and Tibet were, and are, forbidden lands to the European, the Russian and even to the Indian venturer, but for somewhat different reasons. Nepal, as an independent kingdom carved by chivalrous Rajput blades from the Mongol valleys south of the main range, as related elsewhere, has been an ally of the British crown since 1816. Her rulers sent their sturdy battalions to the Sutlej in 1849; to the fighting, shoulder to shoulder with British and Punjabis before Delhi, in 1857; and to many campaigns which culminated in the sacrifices of the Great War, during which 80,000 Gurkhas shouldered rifles for the Emperor of India.

Nepal remains closed because its Rajput aristocracy is none too enthusiastic about the blessings of Western penetration or of an industrial civilization. Who shall blame them? It is enough for Britain's sporting instinct that Nepal retains that fidelity to a pledged word characteristic of such a knightly race.

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Tibet, on the other hand, is closed to the world, mainly for religious reasons. It is justly called The Hermit Kingdom, for here temporal power is exercised by two spiritual rulers, the Tashi Lama and the Dalai Lama, the Ocean of Learning, to use the title conferred by the former Chinese emperors.

Prior to 1903, however, this Tibetan seclusion had been tampered with by Muscovite adventurers from the north. In the tracks of Russian scientists, the Prjevalskis and Bogdanovichs, there came across the bleak uplands the more sinister figure of Dorji. The name in Tibetan signified Thunderbolt and its bearer, either a Kalmuk or a Buriat, Russified it to Dorjieff. After repeated efforts he established himself in what the Third International might nowadays call a subversionary or diversionary movement in Lhasa.

His presence there was not congenial to British interests in Central Asia, so in due course a military mission, under Sir Francis Younghusband, crossed Sikkim, a native state of the Himalayas, and marched over the passes to Lhasa. The Tibetans were "converted" to a more friendly attitude, but meanwhile the mission did not neglect the claims of science. A detachment of the ever-enterprising Survey of India, under Ryder, re-

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ferred to above, not only mapped thousands of square miles of unknown country in Southern Tibet, but took observations of Mount Everest and its neighbors from the north. This work, although done from a distance of sixty miles, taught the world a great deal about the conformation of the mountain and its adjacent rivals, and substantially confirmed the earlier observations as to its height. Not only did Ryder's party verify the preponderance in the height of Mount Everest over all other peaks of the range, but they took further observations to the northwards, embracing peaks far into the interior of Tibet. They proved, to reiterate, that there in Southern Asia the great mountain had no possible peer.

It should be added that, in spite of the rumor of legendary peaks in New Guinea and elsewhere, the scientific world was now satisfied that Mount Everest was the world's highest mountain.

Nine years elapsed before the next step forward, made by Colonel Noel and described in his address to the Royal Geographical Society published in its journal of May, 1919. To him science owes the transition from strategy to tactics, for he reconnoitered the position from close quarters, to the southeast of Everest,

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and covered to a large degree the groundwork preliminary to operations against the great peak itself. Captain Noel's work appears to have provided at least one of the *stimuli* which led to the formation of the Mount Everest Committee by the Alpine Club and the Royal Geographical Society.

To proceed, a second reconnaissance was sent out before the legal termination of the Great War. It was even more thorough than Captain Noel's lone venture. The story of the great work of 1921 has been so well told by Colonel Howard Bury, that one may not venture even to summarize it here. The interested reader should consult his work to see how this major tactical reconnaissance prepared the way for the exploit of 1922 and 1924, and the glorious failure of that assault.

Up to the inception of this phase, each attacker had made his plans against the stronghold in terms of the long-range artillery of his theodolites, while the close support weapons of his plane-tables and survey cameras were assigned to the bayonetmen and bombers, as it were; to the actual stormers—the climbers themselves.

Still, as early as 1921, the air weapon had appeared on the horizon. Only, General Bruce, limited by the possibilities of the engines of those days, envisaged air-

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planes as vehicles for the transportation of material to the intermediate depots and dumps rather than as a front line means of attaining the objective or of obtaining scientific results from the surmounting of the crest.

The simple Tibetans, however, who looked upon the skis of some of the climbing party of 1921, quite made up their minds that they were in the presence of flying machines. Coming events cast shadows rich with significance for the primitive-minded. It was on winged skis of Westland make, the Houston and the Wallace, propelled by Pegasus engines, that Mount Everest was finally scaled.

### III

## Final Tactics and Objectives

*The Significance of the "Survey of India"—A Descendant of its First Chief Discovers the Way to Fly over Everest—Approved by the Royal Geographical Society—Permission Obtained from the Maharaja of Nepal—Training in England—Base Granted in India—The Rumba and the Terai—Equipment and Purpose of the Flight—Aircraft Chosen and the Personnel*

EVER in the forefront of the battle were the men of the Survey of India, with its great traditions in their hands, and eager to maintain them; to keep them worthy of Sir George Everest, who had done so much to enhance them, worthy of Colonel Valentine Blacker, the first Surveyor-General of India.

It was the latter who executed the first complete map of Hindustan, still preserved by his descendants at Elm Park, County Armagh, in Ireland. So it is fitting

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that a descendant of his should have been among the first to complete a flight over Everest and even more fitting that this same descendant, L. V. Stewart Blacker, should have been the man to devise this flight. For a Blacker it was, who, at that time (1932) a major in the Indian Army on leave from the frontier, seized on the fact that the Pegasus engine, with its supercharger, had at last brought the dream within man's grasp and that a British airplane might overcome the physical obstacles and win the long sought prize. By parenthesis, the originator of the plan, although a soldier, had, in addition to some years of flying experience, taken his pilot's licence under the auspices of the Bristol Company's school as early as 1911, only missing being in the first hundred by ill-luck. The cooperation of the progressive Bristol Company with their former pupil and his plan was cordial and generous.

But, to go back, in 1921 the good name of that organization rested with Morshead and Wheeler, both of the Royal Engineers, whom Science will long remember for their gifts to her. The Survey of India is accustomed to breaking records, and Morshead's party must have broken many during their work of mapping the northern, that is, the Tibetan slopes of the moun-

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tain, its glaciers and offshoots. Again thousands of square miles were mapped and for the first time here photographic survey methods were employed, based on Canadian precedents. These proved of definite value and added considerably to the results produced by the indefatigable plane-tablers, Lalbir Sing Thapa, Gujjar Singh, and Turubaz Khan.

Still, the work and the map were limited by the frontier line between the two states, which passes, or by a polite understanding is considered to pass, neatly through the summit itself. In other words, Everest is regarded as lying half in Tibet and half in Nepal.

Of the south side nothing was known within twenty miles, and even there only the exiguous lines made on the maps by the intrepid Hari Ram and Gandarsan Singh in the 1880's, and but little on each side. The map sheets resembled the black and white geographical efforts of the preparatory schoolchild, who is induced to draw mountain ranges in the guise of hairy caterpillars, wandering irregularly over the paper.

This, however, was not a final effort in the realm of ground survey. In pursuance of its progressive policy of borrowing from the West those things of real advantage, the Government of Nepal, during the few years



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after 1925, carried out an up-to-date survey of the country.

Nepalese surveyors were trained in the efficient school of the Survey of India. Others were lent, and by their unremitting efforts with theodolite and plane-table, the torch of science was carried through the trackless jungles and over the myriad mountain ranges of the kingdom. Modern maps were produced and published of Nepal, up to the spurs of the main Himalaya on a scale of a quarter of an inch to the mile.

A survey party actually penetrated from the southward up to the tiny remote monastery of bleak Dingboche, to reach which it had marched through the minor ranges of Nepal, dwarfed beyond conception by the giants Everest, Makalu and the South Peak, but greater than several entire Switzerlands.

Dingboche, however, is still ten miles from the foot of Everest as the airplane flies. All the toils of the land expeditions of 1921, 1922, 1924, and 1933, and the skill and vigor of the West were concentrated on struggling, and struggling in vain, over the bare two miles between the North Col and the untrodden summit.

Imagination shudders at the task confronting those whose might contemplate traversing the infinitely

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more dreadful ten miles of the ground northeastwards from Dingboche.

There remained the airplane.

It was by special favor of the Maharaja of Nepal, accorded in the spring of 1932, that the aircraft of the Houston-Everest flight were to be permitted to cross the jealously guarded border of Nepal, to show the world how the attack might be carried by air over the summit of nature's last stronghold in the mountains.

The grant of this favor was in itself a testimony to the value of the survey work, the demonstration of mapping possibilities from the air, planned by the originators, and to which the Government of Nepal accorded due appreciation. The approval of the Royal Geographical Society was the foundation stone of the expedition's plans, for this drew the attention of the Air Ministry to the value of the project, the resultant combination paving the way for an approach to the Government of Nepal.

The arena was a fitting one wherein to splinter a lance for Science; for from time immemorial, adventure has stamped her impress on the length and breadth of the historic kingdoms of Bengal and Oudh. Here

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roving blades from the heart of Asia, from Moghulistan and Ferghana, the lieutenants of Baber and of Humayn, carved for themselves principalities and satrapies. Here the bold venturers of the Honorable Company, Clive, Stringer Lawrence, the Skinners, and the Harseys, toppled the Mogul pro-consuls from their gemmed seats of ivory, and coming from the East, pushed their own frontiers up to the marches of the veiled kingdom of Nepal.

This remote realm had, as we shall see, been the prize of generations of knightly Rajput rovers, driving down from the western deserts in their Viking-like quests for honorable advancement.

They subdued in the eighteenth century the bullet-headed Mongol clans of Gurkhas, surging up to east and north, until only the stupendous rampart of the Himalayas forced them to call a halt.

From the Black to the Yellow Sea runs this chain, and here in its center, Mount Everest towers above Nepal, above all Asia. For the mountain forms a boundary pillar, and through its apex, on which the eye of no man had ever looked down, runs the frontier between two worlds. To the north lies the stark, glacial, wind-blasted plateau of Turan, stretching for

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months of caravan marching up to High Tartary, Siberia and the Arctic. To the south, on the contrary, there holds sway a whole genial pantheon of cheery gods and goddesses, fairies and sprites, most benign, and full of kindly sympathy for the foibles of Aryan man, convivial and even amorous. Possibly the venture was from the first looked upon kindly by Krishna himself, that pilot of heavenly chariots in the old Sanskrit epic. So Mount Everest, unknown even by name to our ancestors, is not only the culminating pinnacle of the world; but, as befits its tall majesty, the dividing line between the two most numerous races, the two great cultures, the two great philosophies, and the two great ways of life on this planet. Thus it was indeed to the newel post of two worlds that the little band of airmen planned to convey themselves in machines, which were an epitome of the British airplane-maker's craft and of his scientific skill.

To reach it, they would have to pass over a zone of virtually unknown country, and over that belt of terrific declivities which no human being had ever trod.

Exactly what lay ahead no one knew, but it was clear that only by the instrumentality of the airplane could that great barrier be surmounted, and then only

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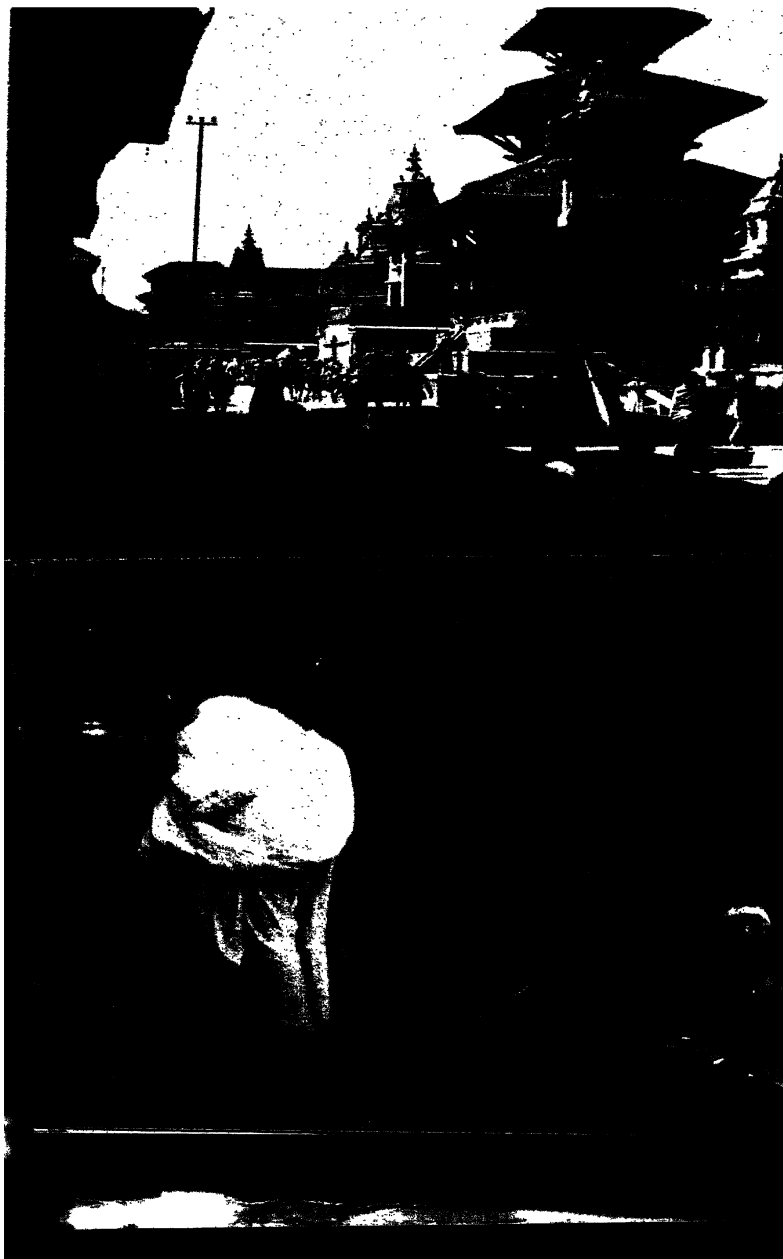
### BEFORE THE POTTER'S SHOP

The pottery and earthenware merchant is an important member of the shopkeeping fraternity in Nepal. A country still isolated from the civilized world, Nepal is yet largely dependent on the work of primitive laborers and craftsmen.

### HILLSMEN OF NEPAL

The pipe with which the Nepalese farmer beguiles his leisure hours is a highly elaborate contrivance. This villager is settling down for a comfortable smoke while his youngsters play before his cottage on the hillside.





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by means of a most carefully planned expedition and meticulous staff-work, could the risks be so reduced as to make them reasonably justifiable.

One of the earliest steps was to choose a possible aerodrome or advanced-landing ground, from which the aircraft could take off for their flight. The conditions under which sanction was given indicated some locality in Bihar, where, as it happened, a prepared landing-ground belonging to the Army Department already existed. This was conveniently situated on a railway line, with administrative facilities at hand, in the shape of a magistrate, police, a hospital, post and telegraph offices, and last, but not least, a small permanent meteorological observatory. This landing-ground was near Purnea, at a hamlet called Lalbalu.

And here the long arm of coincidence pointed to a strange fact, which we took for a good omen; for it came to light that it was precisely to this spot in all the wide spaces of Bengal that the uncle of our chairman, Lord Peel, a Captain Peel, V.C., of the Royal Navy, sent a small party of his bluejackets to attack some of the 5th Irregular Cavalry of the Bengal Army, which had mutinied in 1857 on the outskirts of what was now the aerodrome itself. The landing party of sea-

### THE CAPITAL AT NEPAL

Khatmandu is rich in highly ornate temples and colorful bazaars. Here is one of the city's typical thoroughfares where natives meet to trade, gossip and dictate letters to professional scribes.

### A TEMPLE IN NEPAL

In Nepal, as in India, the temples are sanctuaries for holy men of all kinds. The religious ceremonials and the holy shrines of Nepal are scarcely less interesting than those of India.

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men from Calcutta sighted the glint of the mutinous cavalrymen's lanceheads above the low-lying mist of the early morning, and from the cover of an embankment they opened a brisk fire from their muskets, quickly routing the lancers who fled over the frontier into the jungles of Nepal, where, no doubt, they were finished off by the tribesmen. Possibly the inspiration for Mr. Kipling's story, transplanted to the northwestern frontier, came from this incident.

The Army Department generously placed the Lalbalu landing-ground at our disposal, and it proved admirable for the purpose, possessing a level surface of turf remarkably good for India, if somewhat dusty. We found that little work was needed beyond an improvement of the white markings, the erection of portable hangar and tents and the sinking of one or two tube wells.

The landing-ground was ten miles east of Purnea itself, and 260 miles north of Calcutta, the dusty and not too level motor road from Purnea to Siliguri and Darjeeling running alongside it.

To reach the mountain from Lalbalu, the airplanes would fly almost due north for some fifty miles, first over checkerboard fields, and what in former days



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were exceedingly rich plantations of indigo; then over the amazing thirty-mile level stretch of turf called the Rumba. Here all the Air Forces of the world could land in safety; and this zone, unbroken by fence or ditch or anything but an infrequent tiny patch of dusty furrows, runs to within a few miles of the frontier line with Nepal.

It was no doubt the temptations of this huge stretch of what men call "cavalry country" that led to the stationing there in the old days, of a brigade of cavalry.

Here and there are ruins of old indigo factories, and tumbled piles of strikingly fine brickwork which had held their boiling-vats. In the center lie the picturesque ruins of a castle-fort of the Mogul days, if not earlier, called Thakurganj.

Along the edge of the Rumba, almost due north, runs a little-used narrow-gauge railway, through Forbesganj to Jogbani, the village *entrepot* for trade with the Nepalese villages of the plains, by goods carried on pack ponies and small ramshackle bullock carts.

After Jogbani the fields, grassy swards and cultivation of Bihar, give way to a savage wilderness of almost pathless jungle, the hunting-ground of the tiger and the almost extinct Asian rhinoceros.

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The flight over this zone, called the Terai, would, it was estimated, occupy perhaps ten minutes, though an attempt to cross it on foot would exact many days of arduous marching. The machines would pass the frontier here at a height of at least 12,000 or 15,000 feet, and therefore be inaudible to those on the ground, and if visible at all, appear only as mere specks.

The Terai, though seamed with foothills and ravines, cannot be termed mountainous, and not till further north would the aircraft fly over the real Nepal.

Here is a well-ordered land of green and olive-brown mountains, rapidly increasing in height and grandeur but separated by fertile valleys, full of luxuriant rice-fields in countless terraces, won from the iron slopes by hard human toil. The upper hillsides, matted at their base with rhododendrons and subtropical growth, soon clothe themselves with dark pine, ilex and, in the end, with sparse birch.

The somber green mountains become huge swelling breasts of struggling upland turf, mottled with masses of water-borne boulders, streaked with torrent beds, with stark cliff and great rock faces, and then in the high levels, overmastered by mighty glaciers.

No imagination was able to forecast the majesty of

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that stupendous declivity of Mount Everest's southern face, till the airmen themselves should see it at close quarters.

The actual objective of the airmen was a point in space directly over the highest summit, for it was unnecessary to go beyond the actual confines of the kingdom of Nepal, nor was there any desire to do so. Tibet was forbidden, and the aircraft might not fly there, even in the fringes of the stratosphere.

The conditions under which the attempt would have to be made differed profoundly from those of a straightforward attack over an ordinary flat country and on a conventional height record. No meteorological expert, nor any airman, however experienced, could foretell what turmoils and tantrums would be met with in the higher air close by the mountains. The expedition secured the cordial cooperation of the Indian Meteorological Department, and the dispatch of wind and weather telegrams from the permanent observatories of Katmandu, Darjeeling and Calcutta were arranged for; but the direction and velocity of the wind might change fundamentally by the time even the 25,000 foot mark was reached. In the vertical plane, again, there would be unknown maelstroms. On the leeward side

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of even small mountains there swirls a vast eddy with what is known as a transverse horizontal axis, one side of which sweeps down, carrying all with it; for it has a force and speed scarcely to be grasped by the mind. The defences of Everest are, therefore, not merely static or passive. There is an artillery of the elements sweeping the approaches to the final stronghold, a barrage vaster than gunner ever served.

Again, two physical, or physiological, dangers threaten the high-flying airman. At sea-level itself there are only twenty-one parts of oxygen in every hundred of the air we breathe, but at the relatively moderate height of 28,000 feet, human lungs take in less than one-third of the volume breathed at sea-level.

Pure oxygen then would have to be carried and inhaled to enable the blood to eliminate the carbon-dioxide produced in the muscles by any sort of effort. Only so can heart and lungs sustain the labor of pumping and purifying the vitiated stream. Yet more important still is the supply of pure oxygen for the brain of the airman. Without adequate oxygen transported to the brain in the cerebral arteries the perception becomes dull, judgment is impaired, and the flyer's mental processes go awry. He concentrates excessively

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and exclusively on one particular aspect of his task till other essentials and precautions are forgotten in a fatal oblivion, and disaster follows.

An even greater danger threatens the arteries of him who adventures into the highest levels.

These vessels tend to burst from the heart's violent pumping and such a state of affairs will, at length, cause loss of vision, a dangerous or fatal lapse into unconsciousness or hemorrhages. The only safeguard lies in the physical fitness of the fliers themselves and in the youthful strength and elasticity of their artery walls.

This was a juncture at which the facilities so generously granted to the expedition as early as the spring of 1932, became of great value; for it was in England, a year before the actual flight, that the prospective fliers were tested in a great steel chamber of the Royal Aircraft Establishment at Farnborough, from which the air was pumped out and rarified to a degree appropriate to an altitude of 37,000 feet.

So much for the principal and major risks, while enough has been said to show that the judgment, experience and airmanship of all the flying personnel would be severely tested. Were the oxygen to fail for even as much as thirty-five seconds, or even the warm-

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ing electric current, which safeguarded any chance droplet of water in it from freezing, the crews would become unconscious. This would be hazardous enough over low-lying flat ground, with 30,000 feet of "air-room" through which the machine could swoop and dive down, until the pilot might recover consciousness and control in the less tenuous air. Over the cliffs and glaciers of the southern face of Mount Everest, the case would be different. The pilot would indeed be fortunate, as well as remarkably skillful, to secure command again over his machine in the small space available. These risks were not to be run lightly and without due cause. Yet the objects of the expedition were ambitious enough to warrant its hazards.

Its scientific object consisted in a demonstration of mapping by air survey methods, the inaccessible cliffs, glaciers and valleys of the southern side of Mount Everest. The aim was not so much to produce an extensive map of any immediate practical utility as to demonstrate to the world, especially to the non-technical portion of it, the relative quickness and facility with which such a map might be made of a region forbidden to ground methods not only by policy, but also by the physical obstacles of the country.

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The expedition planned also to supplement the vertical survey photographs taken along the direct course of the airplanes by a new and experimental method, suggested by the Geographical Section of the General Staff at the War Office, of employing oblique stereoscopic photographs in pairs.

Above and beyond the actual topographical mapping, there was a definite expectation that by a close examination of the obliquely-taken as well as of the vertical photographs, geologists and physiographical experts could add to scientific knowledge. Steps were likewise taken to secure infra-red photographs as well as to investigate the aerodynamic stresses to which the aircraft might be subjected, by records from the accelerometer, an admirable instrument produced by the scientific experts of the Air Ministry.

Again, liquid dip needles was taken, with a view to experimental investigations of the earth's magnetism in the vicinity of the Himalayan masses.

Also, almost unnecessary to relate, each airplane was to carry either a recording barograph or a Jaumotte meteorograph giving an automatic record on a thin sheet of smoked blacked aluminum of the minute to minute changes in barometric pressures and in tem-

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peratures, to which the aircraft would be subjected during the stresses of their climb.

So much for the objects and the objectives. Mount Everest had stood thus far inviolate to all attacks, whether by sap or by assault, for sixty-seven years. Many human lives had been spent in forging link after link in the long chain of human endeavor, while near by the summit, or even perhaps on it, lay the remains of the indomitable Mallory and Irvine.

But besides the more tangible objectives to be attained for science, there was one based on patriotism—to establish to the world the supremacy of British aircraft and engines. The flights would be a test not only of mere climbing power, but of airworthiness and real structural strength.

There might, too, be an economic as well as scientific value in the achievement. The air is the ocean which comes up to every man's door. The services of distribution cannot forever confine themselves to land and water to the neglect of the air.

Transport aircraft must cross either seas or deserts or else mountain ranges. Oceans call for the building of more powerful and more able flying-boats; deserts and great jungles for the organization of chains of



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landing-grounds, signals, lights and beacons; but so far the economic world has almost everywhere, except in the Andes, in New Guinea and between Kabul and Termez, shirked the real problems of mountain flying.

Everest might possibly contribute an important share to the reconstruction of man's industrial life.

The type of aircraft finally chosen to bring Everest into line was a Westland P.V.3. Two were employed. One of them was christened *Houston*; the other, *Wallace*. Both were equipped with a Bristol Pegasus S.3 engine. (See Appendix III.)

For auxiliary service three Moths were secured, three light airplanes which proved invaluable. More about them in the next chapter.

For the convenience of the reader, let us now identify the personnel of the Houston-Mount Everest Expedition:

Air-Commodore P. F. M. Fellowes, D.S.O.—leader and reserve pilot.

Mrs. P. F. M. Fellowes—official hostess.

Squadron Leader, the Marquess of Douglas and Clydesdale, M.P.—chief pilot.

Colonel L. V. Stewart Blacker, O.B.E.—chief observer and aerial still photographer.

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Colonel P. T. Etherton—honorary organizer and secretary.

Fight-Lieutenant D. F. McIntyre—second pilot.

Flying Officer R. C. W. Ellison—reserve pilot.

Geoffrey Barkas—director of camera work.

S. R. Bonnett—chief camera-man and acting observer.

A. L. Fisher—camera-man.

Captain Bennett—medical chief.

E. Colston Shepherd—London *Times* Correspondent.

Burnard and Pitt—ground engineers.

V. Veevers, R. L. Read and W. H. O. Sweeny—camera experts.

T. D. Connochie—business manager for films.

Sergeant Granwood; Corporal Bradley; Fraser, and Young. Mr. Hughes.

These are the men who flew over Everest or who, as members of a ground force indispensable to success, flew spirit to spirit with the actual pilots and observers during their major flights. One and all, therefore, they should be recognized as among those who were first over Everest.

## IV

### The Flight to India

*The Three Moths Take Off for Karachi—Along the Apennines and Above Vesuvius—Delays in Sicily—Carthage at Last—Mersa Matruh Where Cleopatra Entertained Mark Antony—The Holy Land and Damascus, The Beautiful—Bagdad, Red-tape and Sandstorms—The Enthralling Persian Gulf—From a Six-Course Dinner to the Frying-Pan of the World*

AFTER almost a year of planning, an age-long year of training and tests and endless preparation in England, the Houston-Mount Everest Expedition was at last ready to take off for the dusty Indian plain below the Himalayas.

On February 16th, 1933, three light airplanes left Heston, bound for Karachi, an airport on the east coast of India. Three little Moths, a Fox, a Gipsy and a Puss, fluttered their farewells to photographers and friends, setting out as forerunners to spy out the

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promised land nearly two continents away. These aircraft were the light transport scouts and maids-in-waiting to the heavier Westland machines, which, fitted with every improvement and ingenious device, were at that moment stowed safely away in the hold of the P. & O. *Dalgoma*, waiting for their mountain debut on the roof of the world.

In the first machine went Clydesdale with Shepherd, aeronautical editor of *The Times*, and Hughes, the mechanic; McIntyre flew the Gipsy Moth with most of the luggage and spares; while Fellowes, accompanied by his wife, took the Puss, the luxurious cabin-plane lent by Messrs. Fry of chocolate fame.

This was by no means Mrs. Fellowes' first long flight. Small, energetic, a dynamo of enthusiasm and vivacity, she is as air-minded and enterprising as many another of the fair sex to-day, who are turning their minds from that old, swaggering epic song, entitled, "Arms and the Man," to that newer, neater, and perhaps more vivid version, which will one day be called, "Wings and the Woman."

The route chosen for the party of six was the more general one taken by fliers, stretching across France, down the long shin-bone of Italy to Catania in the big

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toe of Sicily, then across the Mediterranean at its narrowest point to Tunis, and thence past Cairo, Bagdad and Persia to the Indus river and the mudflats of Karachi. To the mind of most insurance companies, the route to India by Eastern Europe is considered non-insurable for small airplanes, at this time of year, the principal reason being that Balkan aerodromes are often unfit for use under severe winter conditions. But the fliers were more than once led to doubt the wisdom of this decision, the distant danger of deep snow in the Balkans appearing a lesser evil than the pressing attentions of an eighty miles an hour contrary gale, blowing them back to Europe like the hot breath of some desert genii, when crossing from Sicily to Africa.

But they had started, which was all that really mattered. They were off at last. The busy days of scheming and preparation were finished, the anxious halts, interludes and disappointments were over. Old Man Delay with his rodeo tricks had thrown his last lasso, when they soared in formation through thin clouds into glorious sunshine. Heston aerodrome faded away as a static symbol of the past, the ground had become as dull as a stock exchange story too often told; the

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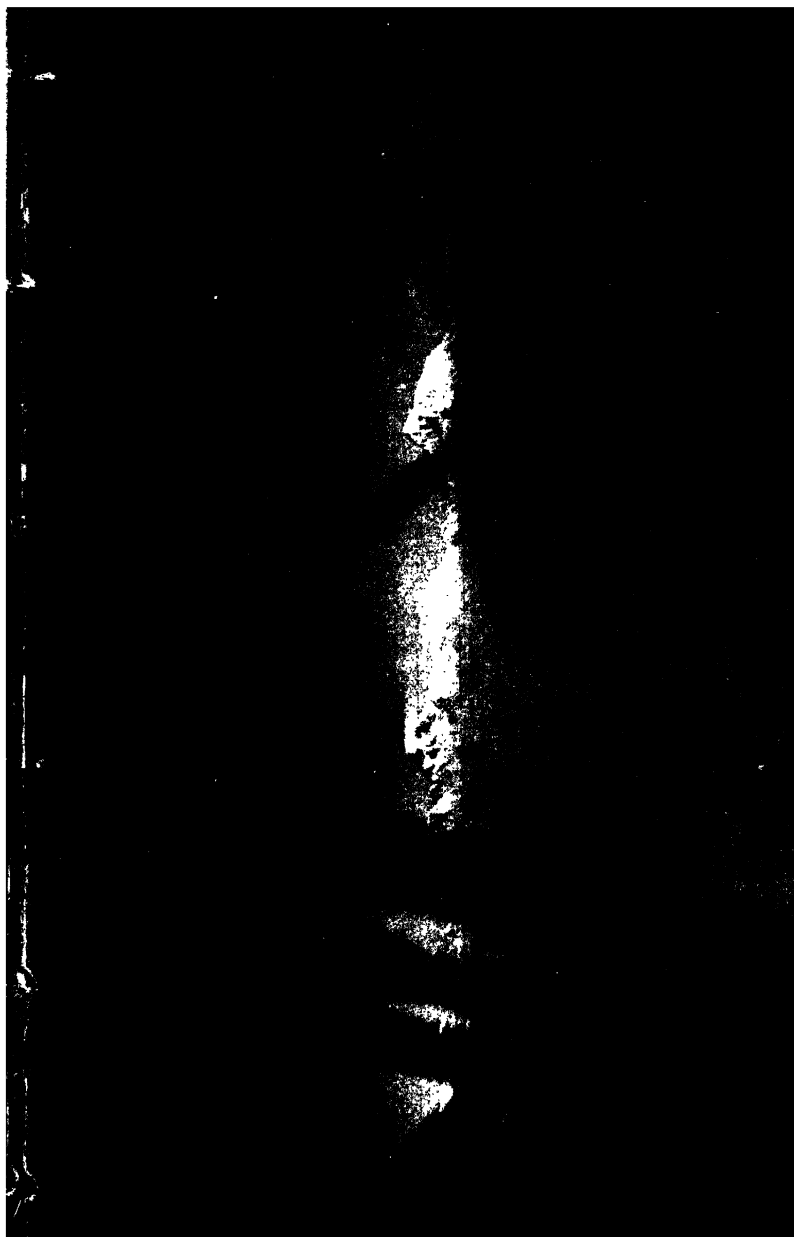
propellers had begun the throb and roar and whirl in their ecstatic rush—the swiftest race yet known to man. For a few moments each airplane seemed to its neighbor to hover and hang almost motionless as some silver bubble over the iridescent mist beneath. Only the roar of the engines gave the impression of speed and progress. In the air the infinite always lies ahead and its symbol is the sky.

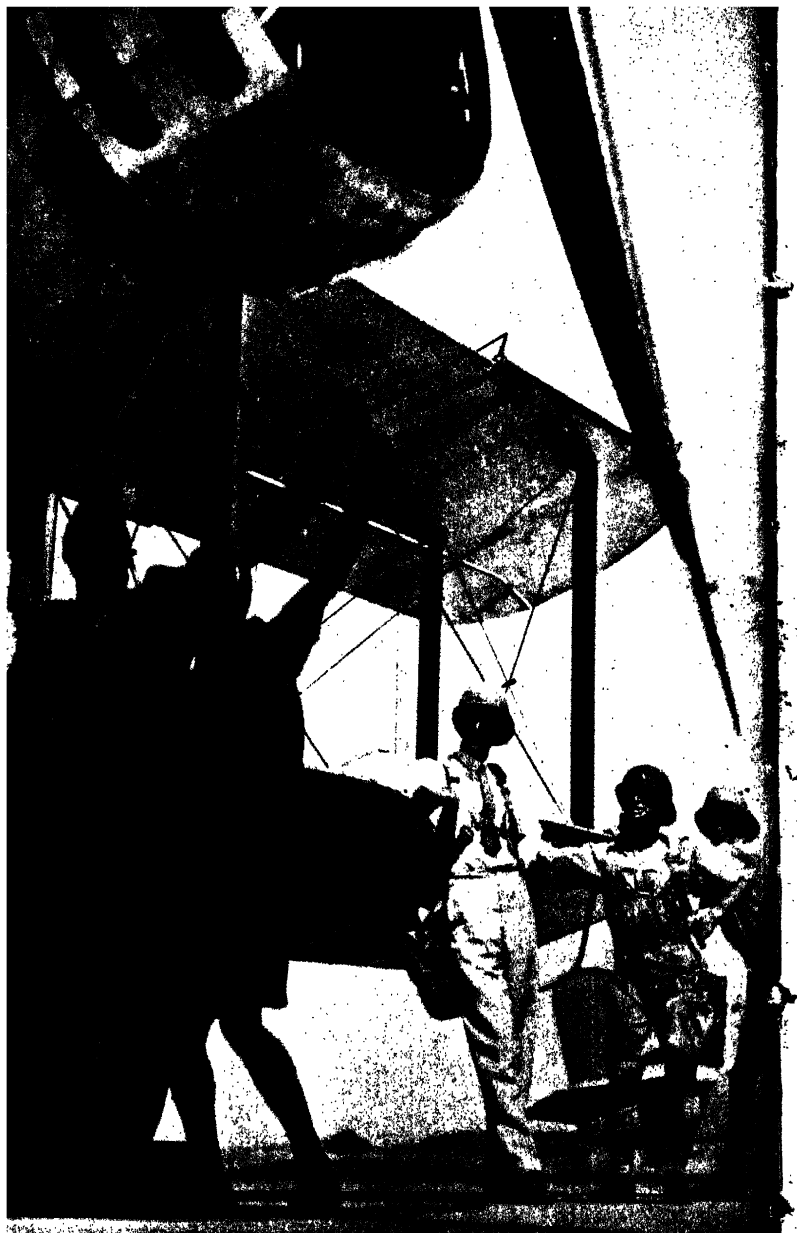
Some there are who travel for the thirst of great horizons and the fever called the wanderlust; others take ship or car that they may have change and variety; but no man or woman will ever have seen one-tenth of the earth's surface or experienced the true height and depth of wonder unless they have taken wings and flown.

Flying can be a real love affair that gets into and occupies the mind. It is a dramatic entertainment that stretches outwards and inwards at the same time. In a curious tingling way it combines the beginning and end of movement. There are aviators, who maintain, not only that the air is the region in which it is easiest to keep awake and watchful, but that flying makes them no longer afraid of time. Of the four elements composing the human environment, air has a fourth

### TWIN GIANTS

Through the rigging of the plane at a distance of eighty or ninety miles near the Nepalese border this magnificent view of two giants of the Himalayas was taken. Everest, with its snow plume, is seen at the left. Makalu, with its enormous armchair formation is at the right. This is the way the two mountains appear to the observer who sees them from the plains of India.







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dimensional gift, transcending the cold fatality of human limits and time-tables or the noisy insistence of mechanical clocks, and holding out already in its hand for its devotees and followers the skeleton key that will unlock the future.

These who go up to the clouds on trips and take their travel across the sky in the simplicity of a small airplane can bear witness to much that is eternal and elemental. They can see the morning awaken and leap from the ground into a new day, they can hear the loud triumphant shout of gales, feel the ghostly touch of cloud curtain and storm, and become acquainted with the fadeless duck's-egg blue of the sky always most tender in color when it has high mountains for its neighbors.

The fliers to India thought of Alice in Wonderland as they looked down at the dancing silver ribbon of the English Channel: "the further off from England the nearer is to France," the Mock Turtle sang in his ungrammatical kind of voice. A pleasing thought to remember as the traveller contemplates the cold and chilly stare of the water. There are people, never invited to attend the Mad Hatter's tea party, who vis

### STARTING THE ENGINES

Man power was required to set in motion the 525 horsepower Pegasus which carried the expedition's planes on the perilous flight above the world's highest peak. The technical problems which had to be solved in the Everest flight were among the most difficult with which modern aviators have been faced.

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ualize airplanes as one day being made of rubber, able to bounce about on the earth or float in the sea.

Be that as it may, whatever one contemplates when flying the Channel, one has to descend to earth again at Le Bourget aerodrome and come to grips with frontier formalities.

Arrangements in French territory are good and fairly expeditious compared with many foriegn countries, but the red tape, restrictions and formalities employed by certain Powers are often most exasperating and out of all proportion to the speed and freedom that should accompany this form of travel. The air-minded of all nations must combine to break down the shackles of a groundling officialdom, if they are to gain the full advantages of aviation.

Heavy travel books, for instance, a necessary part of air equipment, are often an innocent source of worry. In most countries on landing, these books are instantly arrested and removed by the guard, and only returned just before departure; this means that the early morning start so dear to the heart of most pilots has often to be sacrificed because the local authorities are still in bed.

The quickest landing, refuelling and get-away ac-

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complished by the fliers actually occurred at Gabes in Tripoli, where a record of just under an hour was created. It was never broken. Generally an allowance had to be made for a loss of nearly three hours of valuable daylight. The constant examinations of passports, travel books and carnets, can develop into the travesty of some lower form examination in a most private and official school. On one occasion, the perfect counterpart of a blackboard schoolmaster appeared on the scene, a Persian doctor, who, after asking enough painstaking questions to fill a copy book, insisted on searching the airplanes to make an exact tally of the stowaway rats they might be carrying.

In Italy, which the six fliers reached after a rough and windy passage over the Maritime Alps, the difficulties of the party were increased by the fact that none of them knew the language. French may go down quite well; spaghetti, tactfully used, even better, but a working knowledge of Italian would on several occasions have naturally eased the situation, especially where landing in remote places is concerned. To simplify matters, Shepherd was appointed Chancellor of the Exchequer and Chief Major-domo, a post in which he earned far more gratitude than is given to

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most Cabinet Ministers. Clydesdale's faith in loud, clear English, repeated over and over again, was frequently justified by results.

Italy keeps a careful watch on her flying visitors. The enthusiasm over the air is unbounded. A state of air-mindedness and technical knowledge are apparently maintained without difficulty. Probably this high standard, in advance of nearly every other nation, is the result of Mussolini's own experiences and resolutions when himself in the Air Force. The English fliers met many different types and classes of officers among the Italian Air Force in Italy, Sicily and Northern Africa, ranging from slim, eager boys, to comparatively elderly men, aviation providing a common bond of enthusiasm for one and all. Some of the Italian aerodromes are models of efficiency and power.

Flying from Sarzana to Naples, and from Naples to Catania, the three airplanes enjoyed a real Roman holiday. The aerial highway stretches along the ruler backbone of the Apennines and across little tumbling valleys that run like happy children towards the sea. The gusty winds lurking like robbers in the capacious pockets of the Alps are left behind to annoy others. The passage through the ether becomes smooth and

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effortless. Even the snowy crests of the mountains supply no air bumps. The air stands still. There is a luxurious well-upholstered feeling about the world. Down below, on the ground, the grape has become the spoilt child with everything done for it; terraced ranks of olive-trees stand on guard, the silver-grey legionaries of all that land. Little walled towns spring up like Jack-in-the-boxes from the plain, each set on its hill, the houses crowding and cuddling each other too much to show such prosaic sights as streets. Pisa comes as a tilted and tantalizing curtain-raiser to the more opulent glories of Rome, with the final scene featuring a sudden breathless glimpse of the too-famous Bay of Naples. A view of this shapely, sun-burnt town, especially from the air, will revive the discussion as to whether the man who first patented the remark: "See Naples and die," was a poet who meant what he said, or some harmless individual referring to Naples and Mori which happens to be an adjacent suburb.

Crossing the bay and plunging through a cloud of sulphurous smoke, the machines banked steeply to the left and could gaze down thrillingly into the glowing heart of Vesuvius palpitating beneath them.

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Columns of grimy smoke obscured the calm blue face of the sky, and might have been the breath of some evil spirit or ancient Cyclops dwelling amongst his infernal fires. One shuddering moment, and the aircraft darted out of his atmosphere of nightmare into the bright air again. One more circle over Vesuvius and they performed a long glide down to the aerodrome where for the first time their occupants felt the soft peach-warming glow of southern sunshine. Officers of the Italian Air Force came forward to give a friendly welcome that softened the stringent regulations they were obliged to enforce.

Cameras had to be sealed up and films were confiscated, being hurriedly developed and then returned when they proved to be under-exposed snaps of the English machines in mountainous country. As a parting gesture, the sunset gave a dramatic evening performance over the Bay of Naples with a wealth of southern glow and color, transplendent beyond the dreams of a painter.

The next day started in some uncertainty for the fliers. Excessive hotel charges raised the first signs of storm. But there was a stern Scotch strain about the party, coupled to more than a dash of fighting Irish,

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that proved equal to the occasion. We rejected an offending hotel bus, summoned a taxi in its stead, packed up as tightly as a sardine tin for less than half the original charge, and soon reached the aerodrome.

The next stage in the flight to India lay across the Straits of Messina to Catania, in Sicily.

The Moths nosed their way through unexpected cloud, soft-floating and billowing out in white puffs, and with gray masses of flying overcloud that brought rain. Dodging the worst of the storm, the aircraft were soon over Sicily, the romantic land of lotus-eaters and sybarites, guarded by Scylla and Charybdis, between whom has passed much of the romance and legend of classic times. Ulysses, the many-wiled, had come this way, sailing across the wine-dark sea on his return from Troy to get copy for his *Odyssey*. The aviators looking down at Messina from the crystal air might have been compared to some modern argonauts, in quest, not of the Golden Fleece, but of the high, white coverlet that guards the secrets of Everest.

The colors of Sicily, wooed by wine and song, seem more vital and vivid than elsewhere. She has always been something of an international honey-pot and now she fills the profitable rôle of tourist trap.

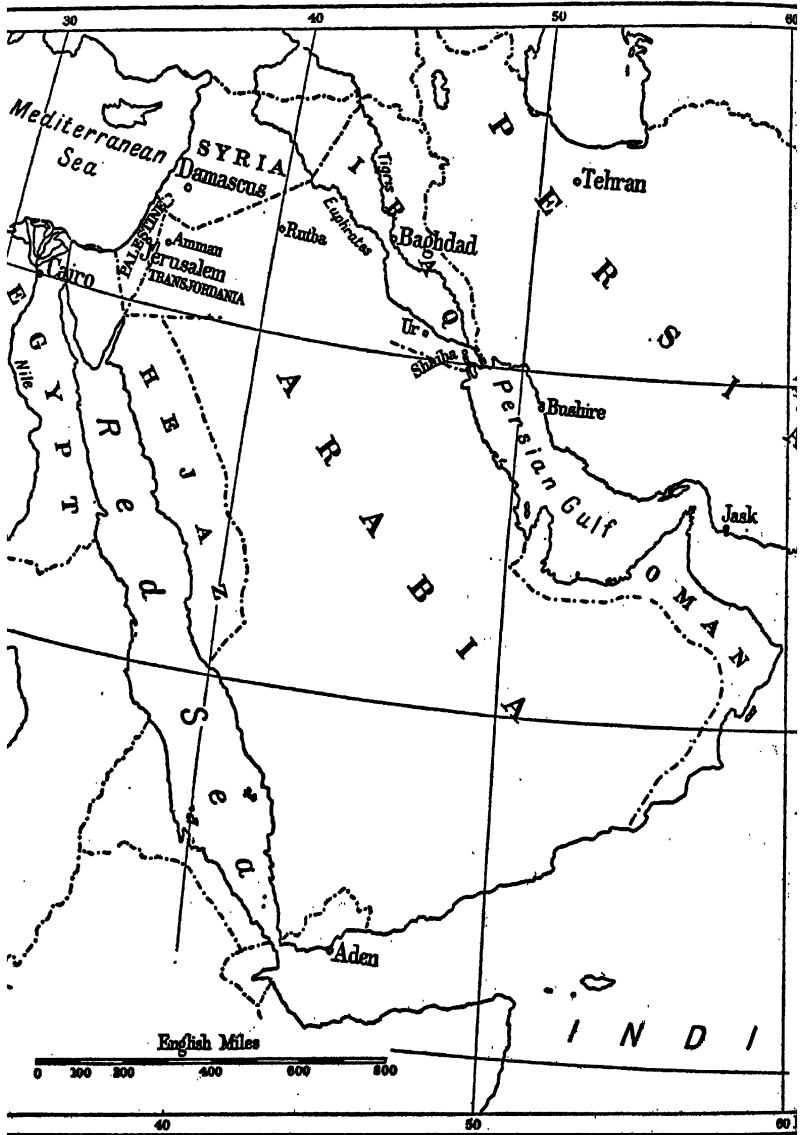
## *FIRST OVER EVEREST!*

The steep streets of the seaside towns were filled with the black, beetle-like figures of the devout on their way to church, reminding all that it was the Sabbath, though the summoning bells were inaudible. Houses showed up as white dots. Dry river-beds ran down to the sea at frequent intervals, spanned by wide bridges bearing witness to the thirsty propensities of the streams that in winter and summer sign the pledge and go dry, but in spring are full of jubilant waters racing from the mountain sides. Mount Etna, cousin to Vesuvius and Stromboli, was found smoking its pipe and wearing, as usual, its hat of clouds, so that although Clydesdale climbed to an altitude of 10,000 feet, he was unable to catch a glimpse of the snow-covered crater.

At Catania, the luck of the party, which had accompanied them all along the route, now decided it was time to take a holiday. In anticipation of a sea crossing of over a hundred miles in a one-engined machine, and the reaction that comes with the thought of water instead of solid earth beneath the fuselage, the fliers had to take due precautions; and the strength and direction of the wind, visibility for navi-







TO SHOW THE FLIGH





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gation, gasoline range, and engine efficiency were considered with more than usual care.

Before they could start, they found themselves under arrest, and at the disposal of the police for flying in all innocence over a prohibited area. By the time Naples had wired instructions, the following wind had become a head gale and all hope of an easy flight to Tunis soon evaporated. Twice they were driven back to Catania by the strength of the storms that soon developed. Terrific lightning flashed and the air was full of bumps and violence. Three days of waiting followed.

Finally permission was granted from Rome to move across the island to the forbidden aerodrome of Trapani, 150 miles nearer the African coast. By the time the permit had arrived, however, Trapani was declared unfit for use after the heavy rains, the risk of damaging a machine landing on a water-logged course being considered too great. No Italians were allowed to come down at Trapani; but the wheels of English airplanes are larger than those of Italian machines, and two of the pilots had come from Renfrew in rainy Scotland. McIntyre walked all over the Catania aerodrome, showing the layer of dirt on his

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boots to the Commandant. He explained that the muddy safety-line was much lower down his leg than the one employed in Scotland. Finally, after much persuasion he won the day. The three Moths battled their way to Trapani and awaited once more the verdict of the elements. The local inhabitants shook their heads and croaked like ravens. There was the poor Signorina Angelica who left on such a day as this and failed to land the other side. There were vivid details of a reckless Italian Count who knew better than his mechanic and had never been seen again.

Storms blew up at intervals, and the wind was still a gale, but news from Tunis was better; and on the following day, waving farewell to the lugubrious guardians, the fliers sallied out over the sea. For four days the weather had acted as highwayman and held them at bay; when they dared it to delay them longer, it surrendered.

The planes flew on a compass course between the storms; only the passing of time indicated the strength of wind encountered. As the land disappeared behind, none came into view in front. There was ample time for misgiving. At last the leading machine gave a joyful waggle with its wings.

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McIntyre could see a crocodile-colored shore. He was greeted by the warm breath of Africa, tropical, exotic.

North Africa is like a very old man who can do little work, but likes to sit and brood in the sun. Much of his day is devoted to sun-bathing.

The first impressions of low-lying shores and pointing palm trees, give more than a hint of the continent's giant frame and of the bones of empires that have flourished and turned to desert dust. It looks a land of desolate sandy wastes lost in immensity, shimmering beneath a pitiless sun; yet North Africa contains many fertile valleys and beautiful areas, and perhaps of all the continents it is most suitable for flying. Soon the Sahara, eight and a half times the size of Europe—the Sahara, whose sands can burn shoe-leather and whose far horizons have swallowed up whole caravans, is to be irrigated by the greatest water scheme man has ever had the boldness to conceive or put into practice. The engineers will be the same who built the Panama Canal, and the waters of the Mediterranean will be brought in from the Tunis side. This grandiose undertaking will one day not only make the desert blossom like a rose garden, but will remove

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much of the danger for aircraft traversing the wilderness.

Though the fliers had left Sicily at 1.17 and the distance was only ninety-five miles, they did not pass over Carthage and land at Tunis aerodrome until 4.27. Tunis has the most picturesque bazaars in all Africa, and its attractions had increased for the party while it was remaining an unreachable goal. Charming French officers insisted on taking the party to their mess, where their arrival was celebrated with speeches and the Entente cordially celebrated in champagne.

The rest of the way to Cairo is desert flying and except for short cuts follows the coast-line. It is a well-defined route, boasting far more traffic than is generally known. At one landing-ground there was a man from Nairobi making his fourteenth journey home; at another, two Hungarians dropped unexpectedly out of the clouds; at yet another, there was a Londoner. The arrival of English fliers is an ordinary occurrence, and a biweekly air mail links up the Italian towns and stations in Tripoli. The aerodromes are large and fairly good. The party arrived at one landing-ground just as the setting sun illuminated the desert with a rosy floodlight, and the air was laden



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with scent from the thousand and one wild flowers that stud the Sahara after rainstorms in early spring. A beribboned Mayor acted as host. The machines were swiftly stored away in the big hangar by well-trained natives, and all the resources of the mess were forthcoming, including such titbits as the time from Big Ben and news from London.

An entrancing spot on the coast is Mersa Matruh, in the western desert. Some of the fliers knew this lonely bay years ago when it was quite undeveloped. It is now invested with a modern hotel and a rumor that King Fuad of Egypt contemplates building a summer palace here. History will repeat itself if Mersa Matruh becomes a monarch's home again; for it was here that in Roman days Cleopatra, queen of charmers, entertained Mark Antony in her palace overlooking the violet and emerald waters of the bay and flanked by alluring deep blue lagoons.

The outlines of several lost cities can be seen from the air along this coast, as also the great irrigation cisterns built by the Romans in which to store the rainfall, and provide, like Joseph, for lean years. From the air, too, the division between the sandy desert and

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the broad strip of green, cultivated land watered by the Nile, looks as if it might have been cut by a sword.

Two days' rest in Cairo provided a welcome break in the journey. Engines as well as personnel were in need of rest and attention. Everyone made full use of his time. The Pyramids were found to retain their mystic glamour when seen from the air, the Sphinx's gaze through the distant windows of time and space remains quite unruffled by the approach of man's latest invention, but the sycamore chariots of Tutankamen encased in their gold, turn back many a page in the creaking story of transport development.

The second part of the journey, east of Egypt, brought fresh conditions and added interest. Leaving behind the friends who had showered hospitality upon them in Cairo, the aviators hurried eastward in front of a sandstorm, rose above it into clear air and were soon crossing from Africa to Asia.

Over the hills of Judah the visibility was good, affording intimate glimpses of such places as Jerusalem, Bethlehem and Nazareth.

Seen from the air, the best guide-book for Palestine becomes the Bible. The Holy Land, and the life-story of the Founder of Christianity, unfolded itself in a

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series of pictures that have all the mingled grandeur and simplicity of the parables. Passing swiftly across the granite hills with their amethyst shadows, the clamor of conflicting races and chattering guides, the tawdry display of man-made monuments that disfigure so many of the sacred sites upon the ground, are forgotten or remain unseen. Simplicity counts again. An aerial view of Palestine can bring a clearer sense of its religious reality and its emotional reactions than can many days spent visiting such places in detail. Gone is the shadow of the donkey and the dragoman; in its stead there is a sense of wings.

The Holy Land can best be visualized in the air as the largest oasis in the world, saved from the clutching fingers of the encroaching desert by the Jordan river, that, rising in a cave in Mount Hermon, flows to an unknown end deep in the underworld of the Dead Sea. On one side, is the fierce halation of the desert; on the other, the gentler influence of the sea. But it is only in modern times that the men who go down to the sea in ships have outnumbered those who looked to the Arabian hinterland and the vanished Empires of Hittite, Egyptian and Assyrian.

Palestine to-day has few trees. This is due to the

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fact that the Turk once taxed trees, with the result that the needy inhabitants cut them down. Jerusalem itself, capital of Crusaders and Christians, is grey and grim, as befits a town rebuilt so many times and that has withstood so many terrible sieges. The chief work nowadays is given by earthquakes. All over this part of the world airplanes will be the policemen of the future.

Leaving behind the shining green dome of the Mosque of Omar, the last landmark to be seen in Jerusalem, the party flew over Jericho and the mountains of Moab, making for Amman, the British Air Force station at the beginning of the Bagdad route. This was the first landing at a British aerodrome since the start of the flight from Heston.

Amman is an up-to-date station full of flowers, fresh vegetables and cheerful English voices. King Abdullah, the ruler of Transjordan, an enlightened potentate, had a large white house on a hill, built for him by the British Government.

The Bagdad route was of special interest, for Fellowes had been in command of the detachment that constructed the original track in 1921, linking up the capital of the Caliphs with Cairo six hundred miles

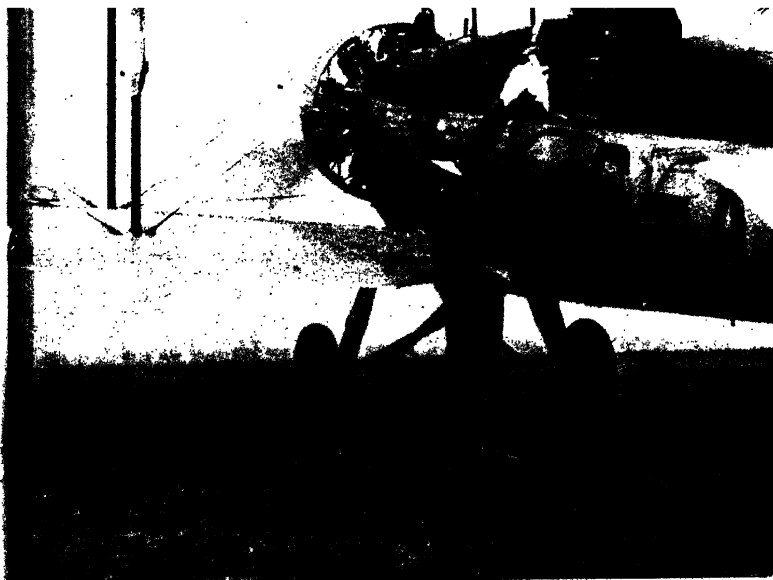
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### THE EVEREST MAIL GOES ABOARD

Letters to be carried in the *Westland-Wallace* on its trip to Mt. Everest's summit are being handed to one of the flyers by Colonel Etherton. These letters, which bore a special cancelling stamp, were afterwards forwarded to Europe. They included letters to His Majesty the King, the Prince of Wales, and Lady Houston, sponsor of the expedition.

### READY FOR THE GREAT ADVENTURE

While the powerful plane is being tuned up, the flyers in their elaborate high-altitude costumes are preparing to climb aboard





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away. The old track, ploughed by lorry wheels, has been straightened out, and is now well marked with signs and numbered circles, that are made still clearer by the laying of an old pipe line. How necessary these friendly guides become can be understood, when it is realized that for vast distances the ground is so similar in appearance that, no matter how fast a machine is moving, it always appears to be in the same place. Without wireless, the chances of being found, if forced down in uncharted areas, are as remote as that of meeting a camel in a New York street.

A sandstorm was reported hard upon the heels of the travelers and dogging their tracks ever since they had left Egypt. In their hurry to avoid it, they had the misfortune to run into its brother coming from the reverse direction.

Sandstorms in the Near East are the most deadly peril that can be encountered in an airplane. They arrive without warning. A car or a camel can be halted, but it is difficult to land an airplane under blinding conditions in which ground and air are indistinguishable. Sometimes it is possible to get high up and above the storm, but often sand and dust ascend to enormous and unexpected heights, as was to be experi-

### EVEREST THROUGH THE STRUTS

During the second flight, this striking picture of Everest and Makalu was taken, framed in the rigging of the *Houston-Westland* plane. A blanket of clouds spreads towards the high peaks and from the summit of Everest stretches a magnificent snow plume. The plume, which stretches eastward for a distance of sixteen miles, indicates the high velocity of the wind at the summit, which reached a maximum of 100 miles an hour.

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enced later in the Himalayas. Aircraft, in fact, are not yet able to regard sandstorms with impunity, and the day when they will be able to do so is still far ahead. Enveloped in a choking yellow cloud, losing each other at frequent intervals, going backwards and forwards, flying so low that they almost touched the track, the three Moths experienced a nightmarish interlude before they were able to grope their way to the safety of the next landing-ground at Rutbah Fort.

A six-wheeler transport coach which had brought in its passengers for dinner on their way to Damascus was parked by the side of an ancient Ford filled to overflowing with pilgrims from Mecca, their household goods piled high upon the guards. Hard by, were three lorries loaded with police and machine-guns, guarding a party of murderers and sheep-stealers rounded up a hundred miles away; a private car, a cavalcade of camels, and the three Moths picketed outside, completed this representative collection of transport, old and new.

With the formidable exception of sandstorms, fliers over North Africa and the Near East are having matters more and more their own way. They have no specter of thirst to torment them, nor, like the



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Bedouin, need they have a terror of alcohol that under those naked skies so easily leads along the path to destruction and madness. They need feel no longer that sense of alienation and hostility which men of the sea experience when first they encounter the long, flat yellow spaces of the earth. It is as though they were offered tickets that it has taken four thousand years to produce, entitling them to receive, alike, the freedom of past and present.

All along this region wind the immemorial caravan routes of Bible times. Abraham, the patriarch farmer, came this way traveling with his numberless flocks out of Mesopotamia; Lot pitched his tent towards Sodom and Gomorrah, now covered by the salt waters of the Dead Sea; Zenobia, Queen of Palmyra, took the yellow road; and Sheba herself, bound on an embassy to Solomon the great king. Strings of camels, often led by a diminutive donkey with a jingling bell, appear over the sand-hills and vanish like a dream. Panting motor-cars overtake one another on the plain, and occasionally other airplanes, passing by, present a striking contrast to the old order of transport. Heaven and Hell meet in the desert and the tourist sometimes finds himself on the road to nowhere.

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Syria is a land better watered than Palestine, and rich in relics of a past, much of whose history is in the Bible. At the foot of the Tiger Ridge of Lebanon lies Damascus, the oldest living city in the world.

In the imagination of the East the ancient capital of the Omayyad Caliphs has lingered as a legend of loveliness. Just as there are great men who center all the genius of an epoch in their lives, so are there certain cities that by their atmosphere and association seem to symbolize the meaning of a nation. Such a city is Damascus—a story-book that characterizes in its pages the heroic past of Islam, all its wars and wonderings and wanderings. The Greeks called it the Beautiful; the Arabs, Pride of the Earth. Mohammed, viewing from afar this emerald in the wilderness, refused to enter lest he should no longer wish to seek Paradise. Girdled in green orchards of walnut and pomegranate, rendered musical and populous by the rills of the Abana and Pharpar rivers, Damascus has played a princely part in all the ancient commerce of the East.

Laden camel caravans have passed down the Street-Called-Straight or Strait, linking up the trade routes between Babylon and Persia, Arabia, Asia and India,

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bringing up merchandise from Palmyra and Aleppo to the Mediterranean. By association and position the town has been the eye of Arabia, walled city of wonder to nomad and Ishmalite, a lure and a magnet to almost every conqueror who has entered the debatable land that separates Asia from Africa.

Saladin, himself, spent his boyhood here, and made the town his headquarters in the war against the crusading Franks. This most chivalrous of Sultans was almost the only Oriental despot to rule his subjects by love, not fear. It must have been a strange sight to see him riding by in his simple black tunic and turban, taking out his gorgeously clad, middle-aged ministers for exercise at the noble game of Mall, or polo, a sport he loved and which the Arabs introduced to Europe.

Damascus, like Constantinople, is still a source of inspiration for the entire Moslem East, though its importance is dwindling with the opening of Western sea and air routes. In the bazaars and booths is a polyglot humanity, Arabs and Africans, smiling Syrians, Druses, Lebanese, negroes from Nejd, and tall Bedouins with the stiff, upright walk of those who ride camels. Modern motor-cars bounce over the cobbles,

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and little donkeys glance lazily at them as they pass in endless streams down the Burlington Arcade of the East. The perfumes of Araby are not lacking, though gone are most of the glories of damask silk and steel. Southwards stretches a vast dusty plain to Bagdad and the southern sea. Damascus is so old that nobody will ever know its age. If Troy was built to the sound of music, Damascus was, and still is, being raised to the sound of running water, the talisman of the town.

In the air all angles of approach tend to become fresh ones. Yet in this cradle of civilization the past still manages to be the present, and to be out of date, or before the time of dates. The traveler cannot help sometimes wondering what would have been the influence of an airplane on antiquity.

What would Elijah have said had two airplanes suddenly appeared, to feed him, in place of the two ravens? What would the plague of locusts have done had they found themselves subdued by a flock of enormous mechanical birds? What would have been the cry of the Israelites fleeing from Egypt, if proud Pharaoh had suddenly stepped from his chariot into his secret bomber and taken up the pursuit?

But the Near East is still a grave and contemplative

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place, bearded with benevolence, slow moving, where the wanderer comes face to face with Destiny, and with himself—so that jests when made are generally personal ones.

Before reaching Bagdad, the fliers passed over the territory of the Akhwan tribe, perhaps the most enthusiastic in their attitude towards aviation of any of the wandering Bedouins. They are constantly on the move and carrying out raids on their neighbors, which are governed by the strictest rules of conduct. One day they are rich and the next deprived of all they possess. Like most Arabs, they are chivalrous to those whom they admire. When on the march, the Akhwan tribe has a strange custom, for one man goes ahead to throw a mantle over a bush to reserve the site for the camp. Although other wayfarers may pass, no one will dream of trespassing on this ground, however attractive and desirable it may look.

If Damascus is the father of cities, Bagdad can be described as its prodigal son. Once the historic capital of Haroun al Raschid, immortalized by the greatest story book of all time, a center of trade, and a home of mystery, learning and romance, the Bagdad of today is not the Bagdad of the Arabian Nights. Palaces,

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gardens and courtiers have gone, and in their place is a dejected-looking collection of modern hovels and mud houses feeding on the dole of past greatness. Gradually, it is being transformed into a city of the West. Bagdad is on the Tigris, the Euphrates flowing thirty miles to the east; and the country is flat, desolate and devoid of the glamour of Palestine and Syria.

The Everest fliers were forewarned about Bagdad and knew that not a trace of the ancient city of enchantment remains, so were spared the disillusionment that awaits those who arrive dreaming of the romantic beauties conjured up by its legendary name. Some writers say that Bagdad's romance and mystery are still revealed to those who woo her assiduously and penetrate beneath the sordid dirty exterior of the modern town. This time Bagdad showed no favors. She barred entrance by a veil of sand, held the party against their will when the day was propitious; and, when they did escape, sent out after them a yellow cloud of darkness.

The city was left in an atmosphere of whirling sand, but after receiving a report that Shaiba was clear, a sandstorm engulfed the little aerial fleet, which was flying in close formation in the hope of

## *FIRST OVER EVEREST!*

keeping together. Acting on advice, they clung to the railway line, the three machines creeping along a few hundred feet above the ground. For an hour and a half they felt their way through the gloom which grew worse and worse, till at length the leading machine signalled that it was about to turn. The others followed suit, but in the instant of turning vanished from sight. Nothing could be seen but the dense yellow fog and dim outline of the railway line below. To search for other machines in such conditions is futile and may easily lead to collision. Fellowes turned his machine again convinced that he could get out quicker that way and, still clinging to the railway, groped his way again towards Shaiba. Fortune favors the resolute, and within a few minutes came a perceptible lessening in the density of the sand. A dim white circle on the ground outlined itself, showing he was over an aerodrome, but holding on to his course he emerged into clear atmosphere, with at least thirty miles of visibility and good clean air to breathe. Only those who have flown can realize the relief at emerging from the sand and darkness into the clear blue sky, but the pleasure was marred by the thought that the others were still entangled in that foul yellow

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cloud. The impossibility of letting them know how near they were to the edge of the sandstorm was galling and induced a mental gloom that was almost as perceptible as that of the sand.

However, three hours later news came in that both Clydesdale and McIntyre had landed safely, first on flat ground near a railway station and later at the Ur aerodrome, and would come on to Shaiba the next morning. With Clydesdale in the Fox Moth were, as at the start, Shepherd and Hughes, the latter suffering from stomach trouble. All three spent the night in the railway station, a record one for discomfort.

This adventure and its worries resulted from being held up in Bagdad for the whole of the previous day—a perfect one for flying. The permits to fly through Persia, due to meet us on arrival, were not forthcoming. It was Friday, the Iraqi Sabbath, government offices were closed, and the Iraqi official brains, even when sought in their homes, were unable to function. No trace of the missing permits could be found. Nothing could be done except to wire Teheran and hope for action in reply, without too much of the delay common to Persia. The following morning the permits



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were produced from a pigeon hole in Bagdad, where they had been resting for at least a fortnight.

The fliers, who had not been beguiled by the faded charms of Bagdad, now began to think of the end of the journey and the prospects of arriving ahead of time. A certain uneasiness began to appear for the first time. Persian officials have been known to force unwanted hospitality upon passers-by, holding them up for days while they investigated some trifling omission in permits. Consciences were not quite clear. Medical permits were on the doubtful side, and there was a distinct vagueness about McIntyre in the official permit. For him the inside of a Persian prison and a long siesta upon a Persian carpet seemed a quite possible fate. McIntyre, one of the most courageous of mortals, refused to take any interest in the journey extending beyond Persia, in spite of the ingenious schemes that were put forward for his rescue should the worst occur. All went well, however; the residents proved most hospitable folk, and no difficulties arose with the officials.

The flight along the Persian Gulf was rendered enthralling, and interesting by the pranks played upon the eyesight by different formations of sand and rock.

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Often whole cathedrals and fortresses would leap into view, seemingly the work of giants, and it was difficult to believe that these effects had had for architects the fantastic force of wind and storm.

This geological stratum continues down most of the shores of the piratical coast, where the main occupation of the inhabitants has always been gun-running and slave-dealing. Even now, despite the constant attentions of British gun-boats from Aden and Perim, the old game is still continued, if to a lesser extent, with the old gamble of profit and loss, and shares invested in human beings. Slaves are usually rounded up in Somaliland and the highlands of Abyssinia and shipped across the Arabian Sea when it is hoped no one is looking.

Curiously enough, African girls, in many cases, are said to welcome with eagerness the arrival of the Arab slaver, much as English boys will run away to sea for the sake of adventure. It gives them a chance of seeing the world, and if lucky, of ending up in the luxury of some rich Mussulman's town house. But for the men and boys, the future is a most unpleasant thought. The slavers no longer deal in large consignments of misery; they ferry over a few people in a

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small boat, limiting their haul to small and select quantities, after the manner of a cracksman who knows the police are watching the "fences."

From the Persian Gulf, the next stepping-stone in the chain of travel was Mekran. The fliers found a rest-house at Gwadar in Baluchistan, if four mud walls, a leaking roof and two wild-looking hillmen can be called anything so western. It was a decided change after the standards of comfort supplied by the Imperial Airways desert houses. But food in the East is often produced as if by a conjuring trick out of anywhere. In four hours' time, thanks to an obliging telephone that answered in English, the fliers were sitting down to a six-course dinner in a neighboring town, on the outskirts of the British Empire in Asia. Hospitality is not easily defeated in the East.

Close to Sind there is an arid, waterless belt of country, without grass or vegetation, that has been nicknamed, "the frying-pan of the world!" Only camels and airplanes can tackle this inferno.

A few hours' flight in the cool morning air above layers of fleecy clouds, a drive downwards into the damp hot atmosphere of Sind, and the welcoming houses of Karachi came into view. Behind, unwind-

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ing like the reel of a cinema, in which operators and actors are one, lay 6,000 miles of travel and adventure. The beauties and variety, the comfort, discomfort and contrasts of a journey by air across Europe, Africa and part of Asia, remained; and above all the comradeship of experiences shared on a high adventure.



## Flights Across India

*Blacker Beats the Moths to Karachi—Meets Them at Delhi—Describes the Party's First Glimpse of Everest by Air—The Westlands Are Assembled—Flight to Their Everest Base—Camera Practice—Hyderabad and Ancient Jodhpur—Delhi Again—The Menace of Vultures—The Ganges and Purnea*

**B**LACKER was the first of the expedition to reach Karachi. He had flown to Croydon on the same day that the Moths left Heston, going in the comfortable modern liners of Imperial Airways. Arriving a fortnight before the other fliers, some time elapsed before he was able to impress on them how much quicker and more comfortable his choice had been than theirs.

In those days, Imperial Airways came to an abrupt and anti-climatic end at Karachi, so he was forced to perform the long journey across India by train.

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First, however, there were details to be arranged at Karachi, where the Aircraft Depot had so kindly consented to erect and test our airplanes in their usual prompt and efficient way. So admirable is the organization at Karachi that the explanations were short and simple and the chief observer traveled on to Delhi. Here again the Royal Air Force not only proffered every assistance but indicated how efficiently that assistance was going to be given.

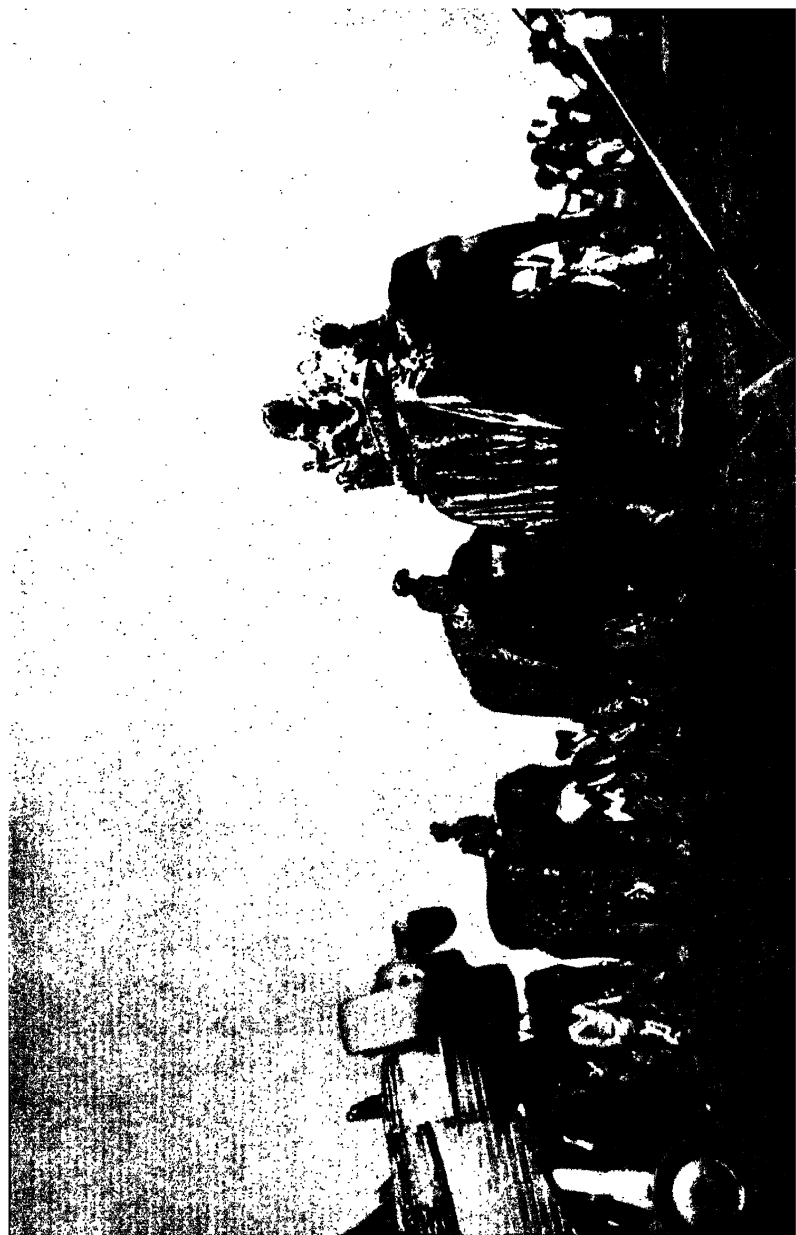
After a brief sojourn in the hospitality of New Delhi Blacker hurried on to Purnea by way of Bhagalpur. The latter town is easily reached from the main line of rail, but from there onward to Purnea, the land journey becomes almost an adventure.

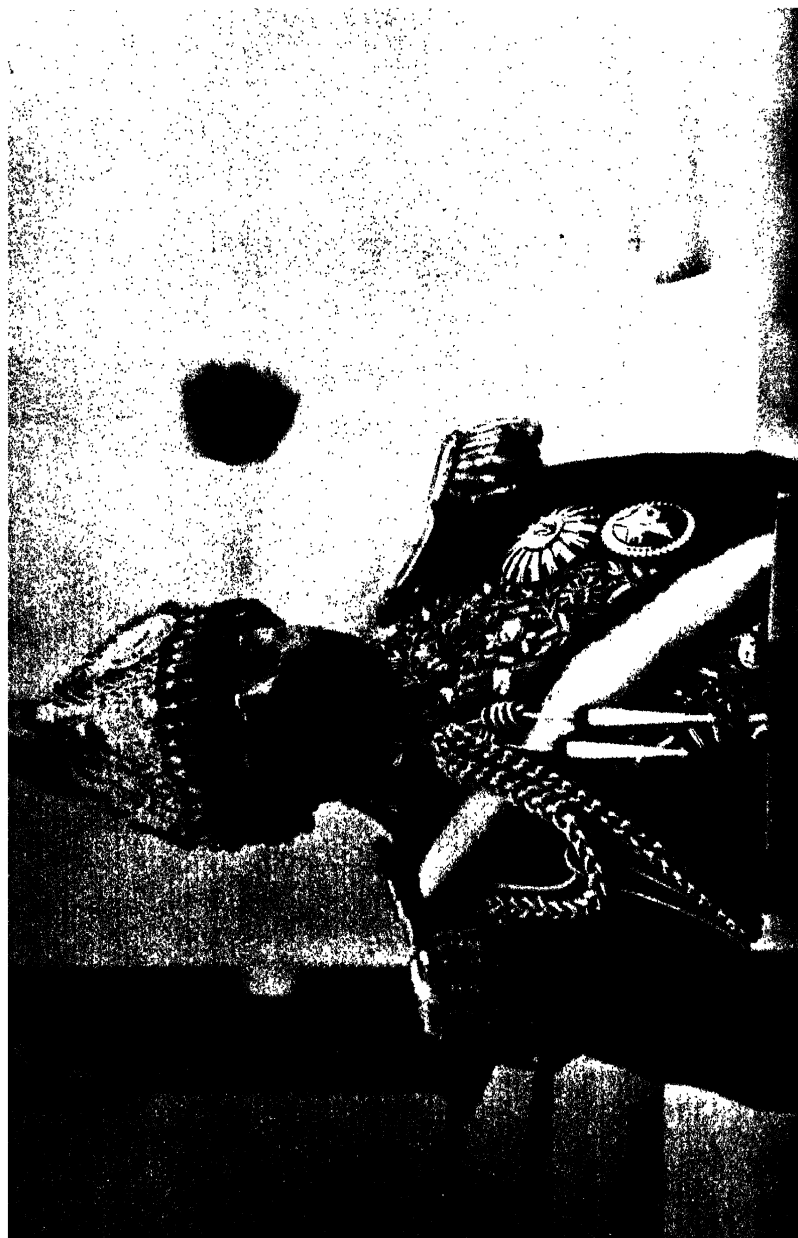
The distance is but forty miles in a direct line, but it takes ten hours or more to get there.

At one phase in the journey, after some travel on narrow-gauge lines, the voyager finds himself on a smart, well holy-stoned paddle steamer, of uncertain age, on the broad expanse of Mother Ganges. At night, with feeble lights blinking on the dim sand bank shores, the voyage seems mysterious and unending, as the paddle wheels chunk their way up the swirling current. Soon enough one is back on the jolt-

### ANCIENT TRANSPORT AND MODERN

Mounted on lumbering slate-gray elephants caparisoned with silk, silver, gold and gems, native Indian potentates rode in state to inspect the two mighty flying machines. Rajahs, planters and peasants extended every hospitality to the expedition.







## FIRST OVER EVEREST!

ing narrow gauge, making change after change. Our observer motored over the last twenty miles to Purnea to encounter a warm welcome. There was no need to stay long, for the arrangements asked for by letter were well under way in the capable hands of Mr. Came, the Executive Engineer of the Public Works Department. It took a day or so to inspect the site of the advanced landing-ground at Forbesganj, to select positions for the canvas hangars and tube wells, and to discuss arrangements with Mr. Sharma, the Deputy Commissioner, and Mr. Bion of the police, each emulating the other in their efforts to help the expedition.

Blacker then returned to Bhagalpur under the hospitable roof of Mr. Dain, the Commissioner, the connecting link between the Government of the Province at Patna and the local officers at Purnea.

The next stage was to Delhi to meet Clydesdale and McIntyre, who had meanwhile arrived in the Moths. Fellowes had decided that it would be wise for the two pilots to obtain personal and preliminary acquaintance with the air route across India, so as to make the subsequent flight with the Westlands as safe as possible. Thus there would be no risk of not know-

### THE ARBITER OF THE FLIGHT

The Hereditary Maharajah and Prime Minister of Nepal, a distinguished and enlightened ruler, granted permission for the two flights over Everest. He had to be convinced, however, that the expedition was being carried on for legitimate scientific reasons and that it was not merely a vulgar stunt flight.

## *FIRST OVER EVEREST!*

ing the way or of misjudging the distance to the next stage where fuel could be obtained.

The three in two Moths, the Fox and the Gipsy, therefore flew first to Delhi and then on through the air over Cawnpore, Allahabad and Benares to Gaya. They passed by Sasaram, nearly over the wonderful mausoleum tomb of Sher Shah the Mogul emperor, and then over the long railway bridge across the Sone river, to the new landing-ground at Gaya, somewhat difficult to find on the south-west of the city.

But let Blacker speak for the party:

It was on our way here that we four, in the two Moths, received our first wonderful sight of the mountain. From Gaya we flew towards the great grey sandbanks of the Ganges, athwart our course.

Beyond, suffused in a dense purple haze lay the plains of Bihar, Asoka's ancient kingdom.

Suddenly, up from out of the hard straight line where the haze met the azure basin of the sky, there appeared three wondrous points of white.

Over our right wings we saw, wreathed in

## FIRST OVER EVEREST!

clouds, that which was Kangchenjunga, and ahead there enthralled our gaze, the far distant crests of Everest and Makalu.

Three immaculate snowy pinnacles swam majestically alone over this wine-dark sea of mist. We could scarcely bear to glide down to land, and so to lose the beauty of this sight, even for an hour.

At Bhagalpur, the *Boggleywala* of Jos. Sedley and *Vanity Fair*, we found not only efficient and energetic preparations in hand for our expedition, but the warmest and most cordial hospitality, from Mr. Dain, the Commissioner, downwards.

We flew on, the forty miles to Purnea, to find the landing-ground already levelled and work well in hand on the hangars.

The hospitality and kindness of the people of Purnea rivalled that of Bhagalpur, from Rajas and broad-acred planters down to the humblest peasants, who made gay paper triumphal arches, decorated with very creditable airplanes of tinsel.

So good were all arrangements that were being made on our behalf, that we were soon able to

## *FIRST OVER EVEREST!*

fly back to Karachi to bring up the big Westlands for their battle with those elemental forces.

Allahabad was our first night's stop on the return journey. Here to our misfortune, after we had lashed down our airplane for the night, a sudden and terrific storm arose in a few moments. Gusts of wind at over eighty miles an hour tore down hundreds of trees, unroofed buildings, and plunged the city in darkness. We were then in the Police Chief's house, eight miles from the aerodrome, arranging for a guard for the machine, when the sudden tempest came up out of a cloudless evening sky. Hastening back in alarm we found the machine uprooted from the great blocks of concrete, the thick hemp mooring ropes snapped, and the graceful little airplane, which had been lifted bodily and high into the air, a pathetic crumpled wreck.

So we made our way sadly by train to Delhi, where a generous Indian gentleman, Mr. Chawla, who had earned fame by being the first Indian to fly himself out to India, lent us his own Puss Moth, at a moment's notice.

It is enough to say that this was characteristic

## *FIRST OVER EVEREST!*

of the warm-hearted attitude of India towards our expedition.

Meanwhile, Etherton had been invited by the Maharaja of Nepal to the fine and seldom visited capital of Khatmandu, to attend the coronation festivities there, the story of which is told elsewhere.

His Highness was kind enough now to renew to him his assurance that the necessary second flight would be sanctioned subject to certain conditions.

It had been recognized at an early stage in the organization of the expedition, that to secure adequate scientific results, two flights would probably be necessary.

Permission for the flight had been given by the Government "purely for scientific purposes" and it was hardly to be expected that all the mass of complicated and delicate mechanisms would operate without a hitch in those terrific extremes of heat and cold.

It was a great relief to us to hear that we might expect to receive this essential permission. Without it, there was a serious possibility of some

## *FIRST OVER EVEREST!*

minor hitch in the first flight, compelling us to return in ignominy without achieving the objects which had already been broadcast to the world.

But before we heard this welcome news, we were back in Karachi where the two Westlands had been assembled, ready for their test flights. We took them up to over 33,000 feet in that pellucid air and found all well. In fact so efficient were our electrically heated suits, that the observers' knees became uncomfortably hot. Without much difficulty we reduced the heating elements and with excellent results.

An interesting observation in connection therewith was that the upper air at this altitude was twenty Centigrade degrees warmer than in England in the previous month. This was contrary to expectation, for we had anticipated the same degree of cold almost everywhere at that great height. Hence no doubt the excess of warmth in the suits.

There followed the now accustomed hurly-burly of departure. A thousand items had to be packed and dispatched, some by train and some by air. Many, such as the oxygen and the signal

## *FIRST OVER EVEREST!*

flares demanded special transportation, whilst at the last moment it was discovered that the spare propellers would go into no ordinary railway wagon. Finally a horse-box was found to fill the bill.

Thus on the 22nd March, after a fortnight in Karachi, the expedition bade farewell to the officers and men of that efficient Aircraft Depot, and flew, in the two Westlands and three Moths, across the trackless desert of Rajputana to Jodhpur.

It was in this way that all our preparations at Karachi had been completed and now we had no less than five airplanes.

The two big Westlands, which had been assembled so efficiently by the Royal Air Force in the Aircraft Depot at Drigh Road, were all ready for the very humdrum task of transporting themselves through Delhi to the advanced landing-ground at Purnea from which they were to fly to the mountain.

It seemed very unbecoming for their dignity that these two fine machines should be loaded up with miscellaneous suitcases, blankets, sun

## *FIRST OVER EVEREST!*

helmets and the like, not to mention a few copies of the works of Messrs. P. G. Wodehouse and Edgar Wallace, for perusal during the long hours of flight across the deserts and over the sun-baked plains of Hindustan. There were two passengers in each of the big machines for a rating of the Royal Air Force was carried in addition to the observer in each case. Both intended to improve the shining hour, very literally shining, by getting in as much photographic practice as possible on the way from place to place. The fitters were to have an easy time in the air with their heads supported on blankets and their feet tucked away in odd corners and recesses of oxygen cylinder racks, but they had the benefit, on the other hand, of the Edgar Wallaces and the P. G. Wodehouses. The observers found plenty to do when anything was in sight, but it must be confessed that there were a great many hundred miles of simply nothing at all and not the most conscientious photographer could bring himself to expend plates and films upon it. However, what there was there was good and extremely interesting. Not only was it interesting, but it was of real



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practical utility as a target for the many cameras of different sorts. This was the more so because the quality of the light was essentially different from anything we encountered in England, or even on the flight out across the Middle East. Not only did it differ in quality but, as might be expected, it was very much more intense. It might be thought at the first blush that these two characteristics were one and the same, but a lesson drawn from the work of the expedition taught us to make a difference between the two, and guarded us against the idea that because the whole sky was entirely blue with a sun of brass blazing down from the centre of it, the intensity of light for photographic purposes would necessarily be very high. We found curious paradoxes in this matter which could no doubt be explained by scientists as being due to humidity in the air and also to the presence of dust which was so impalpable as to be indistinguishable to the naked eye, and this dust we found to be present in the air even at amazingly high altitudes. We were destined to receive very great surprises from this source later on.

## *FIRST OVER EVEREST!*

However, we resolved not to miss any photographic practice, being convinced in our minds that even the most experienced of us had much to learn.

As we took off from the Karachi aerodrome in the usual cloud of dust thrown up by the tail skids, "that agricultural implement that adorns even modern aircraft to the disgust of aerodrome owners," we came soon upon a marvellous tracery of creeks of which the shore of the Arabian Sea is here composed. A lace-like network which stretches for miles and miles from the Port of Karachi, dividing the featureless, bare, sunburnt yellow of the Plains of Sind from the bright blue of the sea, it was a sight indeed to be remembered. Hardly had our eyes left its amazingly intricate tracery than they were caught by another spectacle which was nothing less than the largest building in the world. This is the vast airship shed or hangar which was built to accommodate the ill-fated ships of the Imperial Service of airships and of which the two sisters met their end, one on the ridge of Beauvais, with many gallant souls on board, and the other at the hands of the

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breakers who, with steam-roller and oxy-acetylene jet destroyed the hopes of many lives as they tore down its beautiful shape into flattened tangled masses of metal. Whether or not the airships were to be regretted, no one could say, but the pathos of the sight of that tremendous building struck everyone as we all flew over it and its near-by mooring mast, together in formation. The only advantage which it seems to possess at present is that its existence enables the troops to play two games of football at once under shelter from the midday sun. It is reported, also, that indoor polo is contemplated.

Soon the two aerodromes were behind us, the civil landing-ground which formed then the blank wall which shut off the efficiency and convenience of Imperial Airways well-run liners from the rest of India, and the Service aerodrome, where our machines had spent those busy weeks.

Below us there now stretched what seemed to be boundless immensity of yellowy brown plains, here and there broken by ravines cut away in tangled patterns by freshets and spates of the in-

## *FIRST OVER EVEREST!*

frequent yearly rains. As one looked more closely these apparently featureless wastes became lined and cut-up by great straightnesses stretching unwaveringly mile upon mile through the deserts. These were the new canals and their countless branches which were destined to bring their trickles of life-giving water from the huge river, the Indus, which would turn the waste into a granary. Every now and then, almost by surprise, a single low building, the canal inspector's rest-house, would appear on the bank of some excavation many hundreds of feet below, cut off as it seemed from any other human habitation.

Away to the westward over our port wing-tips we could see the distant mountains of Afghanistan, their summits tipped with the whitest snow and wreathed round with nestling white cumulus cloud. Beneath these fairy peaks there came the now familiar severely outlined zone of deep purple haze, which cut off all the middle of the hills from our vision. Below this again, forming a junction as it were between this wine-dark belt and the plains themselves, was this hard, rugged and endlessly broken up maze of brown

## *FIRST OVER EVEREST!*

stony foothills, where the Baluchi and the Brahui wander slowly, leading their strings of supercilious camels. More than four hours passed of such scenes, and, as one's mind became accustomed to the monotony, suddenly there loomed on the horizon to the eastward a thin line of dark green, which soon took shape and brought us back, as we felt, from nothingness into an inhabited world. We flew closer, and slowly, very slowly—because even at 120 miles an hour nothing seems to happen very fast in the air—this shape took upon itself the form of a big city, which was Hyderabad. It lies on the back of the Indus and is perhaps unique among cities in India insomuch that every one of its many thousands of white cubical flat-roofed houses was adorned with a curious structure which is called in Persian a "bad-gir" or wind-catcher. This performs a precisely similar function to the bell-mouthed ventilator which must be so dear to the sea-faring mind because every ship seems to have them sprouting out at every possible corner. The "bad-gir," however, is made apparently of thin slabs of stone and therefore, for constructional

## FIRST OVER EVEREST!

reasons, no doubt, is prism-shaped and not rounded. It differs, too, from its maritime cousin insomuch that it is not rotatable. It would indeed be difficult, one can see, for a stonemason or bricklayer to construct a rotating ventilator in the materials to which he is accustomed. Fortunately, however, in Hyderabad he is not called upon to do so and *tours-de-force* of this sort are obviated by the convenient fact that the wind blows always from precisely the same quarter. It surges, no doubt, down the stone ventilators and freshens up the inhabitants, and anyone who has experience of the lower Indus valley in summer will no doubt appreciate the blessing of even the smallest puff of wind.

Hyderabad was a very beautiful sight as we saw it in the bright light of an Indian March with these thousands of cream-coloured houses, their right angles throwing myriad shadows and sharp outlines and all bowered by the dark green of the trees. Along one side of this oasis there ran the broad blue Indus and as the pilots crossed this they throttled down their engines and glided on to a good but dusty landing-ground not far

## *FIRST OVER EVEREST!*

from the little rocky ridge which was covered by an ancient fort. As we landed we were greeted by the presence of a whole brigade of mechanised artillery whose officers let their men break off to inspect these interesting new airplanes bound for their distant venture, far away to the northeast.

The brawny gunners produced cameras from nowhere and the outlines of the Westlands are no doubt enshrined on many feet of celluloid.

Almost from nowhere there appeared the indefatigable personnel of Messrs. Burma Shell, and in scarcely more time than it takes to describe it our tanks were being filled up in the efficient manner of that far-flung organization, a manner which at first surprised us from its very excellence but to which in due course from many repetitions we became quite accustomed. As if they had been drilled to it like a beauty chorus, one man produced a huge aluminum funnel, its capacious maw meticulously protected with a double layer of chamois carefully fitted on cane hoops, another produced a little hand-pump of the rotary variety, steel barrels were rolled up as if from nowhere, hoses coupled and soon our special fuel

## FIRST OVER EVEREST!

was foaming and gurgling into the hundred gallon tanks. We could not dally very long for we had to be on our way and soon the ground engineers were straining the muscles of their arms at the big crank handles of the inertia starters. The sun was well up in the heavens by then and the comparative cool of the early morning was long past, so that it may well be imagined that the work of coaxing into activity these great engines of nearly 600 h.p. gave rise to many a trickle on several honest brows. However, the Pegasus behaved well and so did the starters, the mechanisms that is to say, whilst the human portion felt that they really had not much more than a few minutes' wholesome morning exercise.

Soon we were off again, to the accompaniment of a cheer from the assembled gunners and the accustomed cloud of dust from our tail skids. The minutes went on into hours, the photographers took their pictures on their plates and ran their ciné-cameras as long as there was a picture to be taken and then settled down to a fresh contemplation of nothingness, or very nearly nothingness, whilst the pilots scanned the dials of their

### DARJEELING SEEN FROM THE AIR

Thousands of visitors come to the lofty city of Darjeeling to see the magnificent panorama of the Himalayas and it is from this city that many mountain climbers have set out for expeditions. Weather observations for the Everest flyers made here were collected with those made in other regions. This photograph was taken at an elevation of 13,800 feet. The picture shows Darjeeling's dramatic position on the edge of a veritable Grand Canyon.







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many instruments and watched how the fuel level went as hour passed after hour.

The level plains, slightly cultivated and seamed with these long miles of dead straight canals, soon gave way to the characteristic landscape of Rajputana and the wastes of the Great Indian Desert. An immense series of little hills, of sometimes sandy dunes, sometimes bare earth and gravel, are covered for tens of thousands of square miles with unending open scrub and scraggy leafless trees. Hour passed after hour where nothing met the eye but this, until suddenly, again, as we had sighted Hyderabad, there came into our vision the almost legendary city of Jodhpur.

Here is one of the capitals of present-day Rajput rule, whose princes and nobles trace back their ancestry without gap or flaw for two and three thousand years when the Ayrian tribes first rode over the passes from the north into India.

Jodhpur, with its ancient stone castle on the sandstone cliffs of its hills, set in the midst of a vast desert, seems to have endured unchanged since the dawn of history.

Invasion after invasion has swept over North-

### THE NEST OF THE CONQUERING BIRD MEN

The base aerodrome for the Mount Everest flyers was at Lalbalu, on the northern plains of India, 160 miles from Everest. In the center are the two planes which made the flight and at the right and left are the hangars which housed them. In the foreground are some of the natives who watched the activities of the flyers with tireless curiosity.

## *FIRST OVER EVEREST!*

ern India. White Huns and yellow Huns, Scythians, Epthalites, Macedonians and Mongols, the followers of Mahmud and the freebooters of Nadir Shah and of Baber have surged across the valleys of the Indus, but have left Rajputana unshaken; unshaken, that is, until the airplane has brought the first change to those ancient countries that they have seen almost since the days of Abraham.

When we arrived, in the early afternoon of March 22nd, Rolls-Royce cars whisked us away to one of His Highness's palaces, specially allotted for the reception of guests. Here, the Maharaja being away, we were entertained by one of the nobles, Thakur Narpat Singh, a nephew of the famous Sir Pertab Singh. So luxurious were our apartments, and so hospitable our welcome, that grave doubts assailed us lest Jodhpur proved to be the Capua of the expedition and we were unable to tear ourselves away.

At Jodhpur there is a pleasing *mélange* of old time Rajput hospitality with that camaraderie which goes with the airmen of all countries.

Almost under the shadow of the great castle

## *FIRST OVER EVEREST!*

on the cliffs the Maharaja has built a modern airport and one that is probably the best in Southern Asia. The landing-field possesses a level surface well defined and with modern hangars able to shelter the big Fokker liners of the Royal Dutch Air Line and of the French Company on their long flights to Saigon and Java.

The Jodhpur Flying Club has a spacious club house and each evening finds it full of enthusiastic pupils and instructors, both Rajput and European. Throughout the State a network of regular landing-grounds has been prepared whose white circles greet the eye of the air traveler.

Adjacent to the airport is a guest house replete with modern comforts.

The next day saw us early in the air on our way over the desert to Delhi.

Now in these few hundred miles we were no longer in sight of the frontier hills to the westward. The long straight lines of the Sind canals were behind us and we flew for hour after hour over immense deserts. Here and there we could see the fine, almost imperceptible line marking the course of the narrow-gauge railway, and every

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now and then a village of huts ringed round with a formidable thorn fence as a protection against wild animals. Occasionally, athwart our course would appear the straight line of a stark rugged range of hills, the highest rocky crag crowned with an ancient castle.

Round towers speckled with arrow slits flanked the ancient gateways; we could almost imagine cavalcades of Rajput knights in chain mail on plumed horses riding in beneath the two-fold roar of our Pegasus engines.

As the day wore on the desert gradually softened its austerity. Clumps of greener trees, larger villages appeared then a blur on the northern horizon beneath the immaculate blue of the sky. It became distinct and we then found ourselves flying towards the stone splendors of Imperial Delhi, set amongst the seven cities of the past.

To the airman's eye New Delhi possesses a real splendor of its own, hidden perhaps from those who only see Luyten's work from the ground-level. Impressed with its majesty we flew around it to enjoy the spectacle of the vast avenue stretching towards the Arch of Victory and the

## *FIRST OVER EVEREST!*

great colonnaded domes of the Viceroy's house. Save for a slight ground haze, the air had the pellucid clarity of springtime in Northern Hindustan. We enjoyed the rare spectacle, at the same time taking in the weird pillar of the Kutba, the castellated red walls of the Mogul forts, the tempered grey of the ancient lichened walls of Purana Kila, the monochrome of the Jumna's sandbanks all forming a setting for the fresh clean lines of the new city. The observers went hard at it with plate and film, nor did they regret their efforts.

At last it was time to land to be greeted by our friends of the Delhi Flying Club on the aerodrome hard by the domes of Humayun.

The Viceroy has done much to lead modern India into the air and it is largely due to him and Lady Willingdon that the cult of flying is spreading so rapidly amongst the princes.

Next morning we left our kind hosts, in the chilly dawn, on the last section of our long flight from Heston and Croydon. These early morning flights were calm and smooth in the extreme. Not until the day was well advanced did we feel

## *FIRST OVER EVEREST!*

those unpleasantly disconcerting heat "bumps" which mar the pleasure of long flights in the East. We decided to enjoy the present and to dismiss from our minds the bumps which were to come. The landscape was new and entirely fresh. Gone were the olive-clad heights of South Europe, the yellow deserts of Arabia and Persia, and the brown hills of Rajputana. We were over the real Hindustan—the basin of the Ganges and the Jumna, the prize of innumerable conquerors, from Alexander of Macedon to the Moguls.

For untold centuries these plains have been the cockpit of Southern Asia, where Scythian, Macedonian, Bactrian, Rajput, Afghan, Mongol, Turk, Maratha and Kizilbash have fought to gain the treasure of the East. Napoleon himself said that "who holds India holds the world."

We could only guess at the great distance of the horizon all around us. No hill could be seen; we flew on in the mathematical centre of that huge flat brown disc, whose edge was a vignette border of purple melting into the blue bowl of the sky.

The brownness of Upper Hindustan has a pe-



## *FIRST OVER EVEREST!*

cular quality of its own. It is not the yellow brown or ochre of the deserts nor the sienna of the hills, nor the ruddiness of sandstone ridges, but a sepia or a bistre. This color does not belong to any particular item of it, neither to the fields, the yellowy grey tracks, nor the green or blue-green leafage of the trees; yet it is the color of the countryside as the airman sees it. As the sun climbed up from the dusty rim of our circle of vision we came upon circling kites and vultures. We had first met these unpleasant creatures on the flight from Jodhpur and their numbers increased as we flew over the larger towns of Hindustan. They are a real menace to the aviator, but luckily are seldom seen much above 3,000 feet; at 2,000 or so great flocks of them are frequently encountered. The birds themselves are not anxious for a collision with an airplane, but are apt to misjudge the speed at which the machine is coming upon them. It is easy for a vigilant pilot to spot single birds and to dodge them, but it is a different matter when the sky is full of these wheeling pests, for to swerve from one means collision with another. The impact is sufficient to break

the propeller or any interplane strut or spar. In a light airplane the danger is even more acute and the records of Indian flight are punctuated with disasters from such causes. One safeguard is, of course, to fly high, but this we were unable to do on our eastbound journey owing to the necessity of taking as many photographs as possible to ascertain the light values. So we risked the birds and tried not to heed the narrow escapes when a six-foot vulture whizzed past apparently only a yard from our wing-tip.

We made our breakfast stop at Allahabad, mentally cursing the ill-equipped landing-field as our eyes met the wreck of our poor Fox Moth. Here at Allahabad the two great rivers, Jumna and Ganges, meet and here on the tongue of land at the confluence stands the huge red battlemented fortress of the Moguls, visible from afar by its wireless masts. For Allahabad, rather than Delhi, was the old centre of Mogul military power. It commanded the junction of the two rivers of Hindustan. In those days rivers were the high-ways of commerce and even of strategy. To-day the fort with a garrison of British infantry looks

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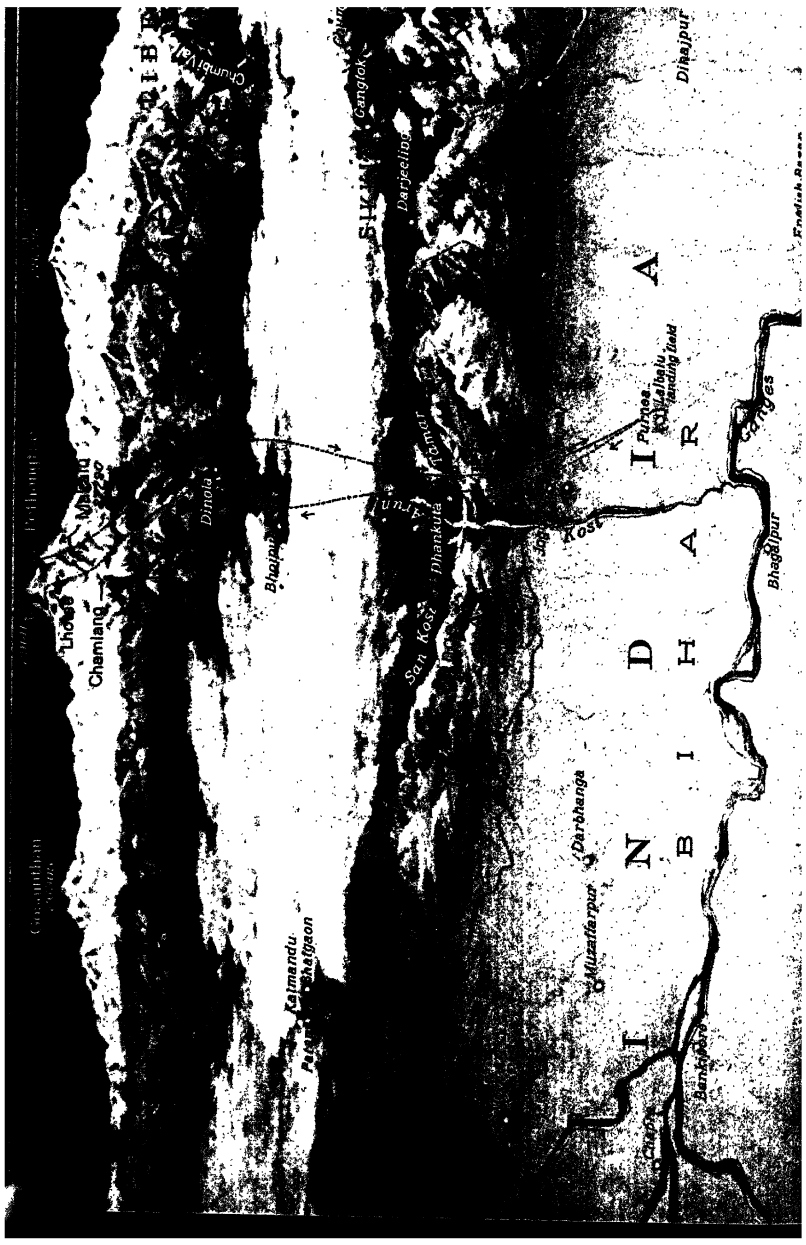
#### A HOLY MAN OF NEPAL

In Khatmandu, the capital of Nepal, this holy man sits at the Sacred Ghats telling his beads. Hinduism of an early type is the religion of the Gurkhas and it modifies the Bhuddism of Nepal's primitive inhabitants.

#### SACRED IMAGE

The god of the athletes and of the daring in Nepal favored the Mount Everest expedition. The Nepalese peasantry, who are very superstitious, believe that Everest and the surrounding mountains are inhabited by spirits and enormous snow giants. Some of them





Government of Bihar

Litsea  
Cherlang

Wazirpur  
Dinohat

Chumbhal

Imamdi  
Patalganga

Bhagalpur

Seer Koha  
Phankura  
Kumar

Sivapatti  
Gangra

Darjeeling

Muzaffarpur  
Darbhanga

Purnea  
Lalabali  
Khandagiri

Barnes

150

100

Bhagalpur  
Ganges

Dhahpur

English

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out upon the great steel girders which carry the main lines of rail down to Calcutta and the distant sea.

On we flew through the unwelcome bumps which the heat of the midday sun brought painfully to our notice. This time we passed north of Sasaram, with its imposing palace tomb of Sher Shah, a Mogul Emperor, and of Gaya, that old stronghold of the Dutch venturers in the East Indies, over which their descendants now operate their weekly service of Fokker monoplanes.

Instead we made our way over the big white houses of green and leafy Patna and its pleasant seeming suburbs of Barrackpore and Bankipore. One might assume that Barrackpore is so called from the fact that since the early days of the Honorable Company there have been the barracks of British troops there, and possibly of French Royal troops before them. One would like to think that Bankipore, standing so picturesquely along the tree-bordered Ganges banks, derives its name from that fact. We were disappointed to find it otherwise. In the slang of the sixteenth century Mogul upper ten, the Bank-

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### THE AERIAL HIGHWAY AROUND EVEREST

The general course of the first flight over the world's loftiest mountain is set forth in this diagram. The position of the Himalayan range with relation to Nepal and northern India is clearly shown. From Nepal to the Himalayas the alto-cumulus clouds stretch across the intervening foothills. The upper peaks of the Himalayas are indicated. Purnea is 154 miles from Everest in a flat, cultivated plain across which runs an amazing tract of level turf thirty-four miles long.

Drawn by Hashime Murayama.  
Copyright National Geographic Society.

## *FIRST OVER EVEREST!*

Log were the "smart set," and so Bankipore was their abiding place, the Mayfair or Belgravia of that world.

Now the country below us had changed again. The open brown spaces of Hindustan had given way to the park-like landscapes of Bengal, full of green trees, square ponds and lakes, with wooden and wattle huts of thatch, occasionally surrounded by palm trees.

Now the Ganges changed from our left to our right hand. We pored diligently over the maps, identifying here a narrow gauge railway faintly below us, and there the confused tracery of the split-up channels of some minor river which had probably altered its course a dozen times since the map was made. The clear metaled grand trunk road faded away behind us to give place to almost indistinguishable dusty cart tracks. Soon enough we sighted the familiar trees and the turfy spaces of Purnea. A turn or two around it to announce our arrival, then a few minutes on, and our wheels were trundling smoothly over our own landing-ground of Lalbalu where the big canvas hangars were standing ready to house our machines for their voyage into the unknown.

## ❖ VI ❖

### Nepal, Land of Mystery and Contrasts

*Visited by Colonel Etherton—Across the Terai into the Valley of Nepal—Khatmadu, the Capital—Reception by the Maharaja—Permission for a Second Flight—When King George Hunted Tigers and Rhinos—The Story of the Gurkhas—Amazing Invasion by the Chinese—War with the British—When a Cow Is Not a Cow—The Nepalese Army—Poor Roads for a Purpose—With the Bible Comes the Bayonet—Delhi Again—The Viceroy and Lady Willingdon Entertain*

THE various members of the party were converging on Purnea in readiness for the great adventure. By different routes—Blacker, Fellowes, Clydesdale and McIntyre by air; Etherton by the more comfortable method of the luxurious P. E. O. Etherton stayed a few days with the Governor of Bombay, Major-General Sir F. Sykes, before going on to the base at Purnea, situated approximately 300 miles north of Calcutta in the province of Bihar. Sir Fred-

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erick Sykes was himself an airman of repute, and consequently took the greatest interest in our plans.

Etherton traveled overland by rail, going first to Patna, the headquarters of the Government of Bihar and Orissa. Sir James Sifton, the Governor, and the officers and staff of his administration had made excellent arrangements for the welfare of the expedition at Purnea; no efforts had been spared to ensure its success and we shall see how well the plans worked out under the cordial cooperation and ever-ready help that were accorded.

From Patna to Purnea is a rapid journey when made by air, but a long and tedious business by rail, since it necessitates the crossing of the Ganges in paddle-wheelers which probably commenced life on the Thames during the early 'fifties.

The Ganges looks anything but the holy river it is; slow-moving and muddy waters flowing through a flat and desolate land at this particular point do not impress the traveler, yet there is no river in the world to compare with it in sanctity and the reverence with which it is regarded by millions of Hindus, whose greatest ambition is to die on its shores and for their ashes to be cast into the arms of Mother Ganga.



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From its source at Gaumukh in the Mountains of Garhwal in the north to the delta in the Bay of Bengal, the river and its banks are holy ground. Where it emerges from the hills at Hardwar is amongst the holiest. Here takes place, every twelfth year, apart from other festivals, the celebrated Kumbh Mela, when the planet Jupiter is in the sign Aquarius (Kumbh), an occasion regarded by Hindus as one of the utmost sanctity. The main object of attraction to the pilgrims is the bathing-ghat, or stone stairway, some sixty steps, one hundred feet in width. At the moment judged propitious by the Brahmins, it is the ambition of each to be first in the holy river, for not only will it cleanse them from all unrighteousness, but is a passport to the Hindu paradise.

Apart from the immense concourse of people there are numberless fakirs, or religious beggars, who practice every form of penance and self-torture to attain salvation. There are those who strip and expose themselves to the sun, surrounded by blazing fires, others who for years have held their arms aloft until by prolonged tension they are unable to resume the normal position.

Beyond the Ganges lies the same flat country, and

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as one approaches Purnea the land becomes less desolate; the roads are wider, with trees on either side, and more cultivation. From the railway station there extends an ample road which leads to the large and shady bungalow which the fliers were to make their home for the next few weeks.

Satisfied that all was in order and ready for the arrival of the main body of the expedition on March 22nd, Etherton, who was chief executive of the expedition, set out for Nepal, which he would reach through Raxaul about 200 miles to the northwest of Purnea.

The object and import of this journey will now be apparent.

The Himalayas or Abode of Snow, to quote the Sanskrit term, lie along the northeastern confines of India. No other mountain range can compare with them in variety, in the loftiness of their heights, in the grandeur by which they are surrounded, and the halo of mystery and romance which overhangs them.

The inhabitants of varying race and descent who live along their western and southwestern borders have as near neighbors peaks towering more than 20,000 feet into the skies and glaciers covering hun-

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dreds of square miles. In the area in question the distances are great, transportation is slow and uncertain, and so far as Nepal, Sikkim and Bhutan are concerned, the railway has not penetrated. They are lands that still remain very much of a sealed book to the rest of the world.

The main chain of the Himalayas stands like a wall dividing Tibet, the mysterious and western China, from India; and even along the Indian side of the range there is still scope for geographical Alexanders.

It is with Nepal that we are especially concerned in the story of the Everest flight, for lying as this independent kingdom does on the side nearest to India and having Everest within its northern limits, it had been imperative to secure the permission of His Highness, the Maharaja of Nepal, to bring the flight to its triumphal conclusion.

The scientific and geographic world owes much to the vision and foresight of this enlightened ruler, who paved the way for a historic flight and advanced the cause of aviation.

We had envisaged the possibility of a second flight over Everest, and without wishing to impose upon

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the goodwill of the ruler who had so readily granted permission for the initial attempt, we were reluctant to have the success or failure of the photographic survey depend upon the results of the first crossing of the peak. Should those results be negative, a second flight could alone avoid the defeat of our aims. It was therefore deemed of vital importance to secure from the governing authority in Nepal the requisite license to make a second attempt in the event of the first being a partial or total failure from the photographic and survey standpoint.

This then was the task allotted to Etherton, who had preceded the rest of the party by sea and was charged with the task of arranging with the Nepalese chief for this second flight, apart from the other administrative duties devolving on him.

It was a two days' journey to Raxaul, for the narrow gauge railways are slow and halts at stations frequent.

Raxaul is two miles outside the Nepalese frontier of India; from it starts the Nepal Government railway, which runs to Amlekganj, twenty-six miles within the Terai. The railroad has been cut through the jungle and rises steadily to the terminus, a puffing

These four pictures show some glimpses of the flyers and the plane immediately before one of the flights over Everest. In the close-up of the pilot, there is a clear view of the oxygen mask, with a microphone in front for communication with the observer. The oxygen pipe is leading around from the front of the mask to the back from whence it goes to the instrument panel in front of the pilot. In the upper right hand picture are seen Lord Clydesdale, Chief Pilot, and Colonel Blacker who acted as Chief Observer and operated the mapping, motion picture, and oblique cameras. At the lower left Lord Willingdon, Viceroy of India, is seen inspecting the *Houston-Westland*. At the lower right Flight Lieutenant McIntyre and his cinematographer are





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and grunting affair for the tiny locomotive, which putting forth its best effort manages to average six or seven miles an hour. At this season of the year the jungles were dry and parched, and not at all indicative of a floral beauty which is their strong point after the rains in October and following months.

The Terai runs almost the entire length of the Indian border of Nepal. It contains many species of big and small game, and was constituted a waste land after the war with the British, as an obstacle to the advance of a hostile force from India. This area comprises extensive stretches of reeds and bulrushes running up to a height of fifteen feet. It is notorious for malarial fever, is full of mosquitoes, and only during the cold weather from October to March, is it safe for Europeans. During and after the Indian Mutiny in 1857, numbers of rebels, flying from justice, took refuge in the Terai, and even the Nana Sahib, the butcher of Bithoor, he who had ordered the tragedy of Cawnpore, is said to have found refuge there. There is a lack of authentic information relating to the end of the Nana, and it is strange that the fate of a man whose deeds were so notorious should continue to be wrapped in mystery.

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### THE GROUND FORCE LOOKS UPWARD

The mechanics and assistants on the expedition waved farewell to the flyers as they took off on the great adventure. Those who did not take part in the flight contributed a great deal to the success of the expedition by helping in the solution of difficult problems in organization and technology.

### THE HONOR ROLL OF THE FIRST FLIGHT OVER EVEREST

To these men the success of the Everest flight is due. What they accomplished in this remarkable aerial achievement is ranked with the most daring work of any modern explorers.

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On the other hand, some accounts relate that the tyrant passed through the fever-stricken Terai in safety, and lived for many years in disguise in Nepal. Various stories are current as to the life of the Nana in Nepal, which may be exaggerated as stories always are with the retelling and lapse of time. However, a forest officer told Etherton some years ago that a survivor of the Nana's party declared that their chieftain had died in the Terai when a fugitive from British justice. Be that as it may, his fate will always be shrouded in mystery; and whether he died in those malarious swamps, or lived happily ever afterwards, the Nana Sahib will go down to posterity as the chief actor in a tragedy which horrified the world; for those figuring in the drama were women and children, and the stage villain one blacker than any tragedy writer has ever had the boldness to conceive.

At Amlekganj, the railway terminus, East meets West again in curious contradiction. The shops of thatched huts with their contents exposed to innumerable flies and dust raised by bullock-carts and motor-lorries, seem strangely out of place with petrol pumps, and other things incidental to modern life. Civilization in the form of motor transport has pene-



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trated to Amlekganj and you mount a lorry passenger-car, which takes your luggage and yourself, under the guidance of a Jehu whose one ambition seems to be to take corners and speed along the highway as fast as his engine will allow.

The Nepalese have constructed an excellent road from Amlekganj to Bhimpedi, twenty-eight miles, passing over the range dividing the Terai from the valleys at the foot of the mountains. The Nepalese can certainly lay claim to distinction as road-builders. They have bridged various torrents with commendable skill, and so rendered the journey a pleasure instead of the nightmare it formerly was, when one had perforce to journey by night in a dhooly, looking like a coffin on poles, to the monotonous chant of dhooly bearers, bored with the task of carrying the traveler.

Bhimpedi, the end of the motor road, lies at the foot of the hills and here I found ponies and servants sent by the Maharaja from Nepal. From here on the road to the capital of the hermit kingdom, is a long climb to Sisagarhi, a fort perched 2,500 feet up and commanding a view of the surrounding country. The road up to Sisagarhi is

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excellent, well graded, and takes only about an hour and a half on the sturdy ponies of the royal stables.

There is a bungalow at Sisagarhi for the use of those traveling on official business, or guests of the Maharaja, and here I tarried for awhile before carrying on to the summit of the Chisapani Pass by a steep track, but nothing in comparison with the descent on the northern side. Over rocks and boulders one goes, slipping and blundering down until the valley far below is reached, when there is comparatively easy going for some miles before tackling the next range.

The hills on either side of the river running through the valley are mostly bare of wood, for the inhabitants have for centuries been levying toll, until now they must go so far afield in search of fuel that it often means a day's journey for a man-load. Through the undulating valley you travel until the ascent of the Chandragiri Pass, an even more harassing and strenuous pathway than the one down from the Chisaanip. But once on the summit the view is superb, and if that is any compensation for physical discomfort one

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may be considered as domiciled in luxury. Ahead lies the valley of Nepal, backed by summits of the Himalayas.

The first thing, however, that strikes one is this Valley of Nepal and the numerous towns and villages dotting its surface far below. There is an impression of density; it looks fresh and green, and after toiling through the otherwise barren hills behind, you feel you have gained the promised land and one to which an air of mystery and seclusion has imparted additional charm.

The inhabitants themselves call the valley Nepal; they apply the term with special reference to it and the capital, and the old records, going back long before the Christian era, show that it was then in common use, so that the stamp of age has given added veneration.

Looking at the northern side, there is an opening in the hills from which emerges a river—the Bhagmati, flowing down into the valley and giving to it some of its extraordinary fertility. Even my guide and official major-domo was impressed and told the story of how the Bhagmati originated.

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Vishnu, the Hindu deity who shares the allegiance of his followers with the other god Siva, is an active god who traverses the heavens in three strides, which represent the rising, the meridian, and the setting of the sun. He also descended, in one of his incarnations, as a tortoise and proceeded to deliver the world. In the course of his athletic activities he came to the Valley of Nepal, and saw that there should be an outlet for the water, so with a mighty swing of his sword he cut an opening through the mountain for the Bhagmati.

There is no census in Nepal, so an accurate estimate of the population cannot be given, but so far as the capital and its adjacent towns and villages are concerned, it is probably about half a million.

From the top of the Chandagiri Pass, we went down by another steep and rocky path through the forest to Thankot, whence there is a good road to Khatmandu, the capital.

Nepal is a country of contrasts; age-old conservatism and a dislike of the foreigner and innovation are factors in the life of the people, yet

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motor-cars and lorries are common in the streets of the capital and outside, and an overhead rope railway for transport of goods is in operation from Bhimpedi to Khatmandu.

After having struggled up and down the tortuous and rocky paths from the foot of the hills to the capital, and over huge stones and boulders, in many places with a gradient of one in three, we were all the more impressed with the energy and carrying power of the Nepalese coolie in bringing these cars and lorries into the country. They are carried in bodily, only the wheels being removed. Eighty or more coolies shoulder the long stout poles to which the cars are attached, and with a popular chant, much pulling and persistence, they are borne over the hills and down into the comparatively level ground of the Nepal Valley.

They may do only a mile or two a day, but that matters little in the Orient, where the more leisurely mode of progress is preferred to the hurry and rush of the West.

So it was we came down to Thankot, five miles

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below the pass, to find an up-to-date motor from the Maharaja's garage awaiting us.

Nepalese chauffeurs could never be accused of loitering; the instant I was in the car the driver "trod on the gas," gave an impressive hoot and went off like a rocket. Along the road we tore, past slumbering cottages, sundry pedestrians and livestock in the streets, which we missed by inches, and in and out of the night traffic between peasants hurrying home to bed with bundles upon their heads. The marvel is that we didn't hit anything. My chauffeur felt the weight of his position, he evidently appraised me far higher than I did myself, and so, having thought of all my past sins, I was resigned.

During my visit to Khatmandu I stayed at the British Legation, with Colonel C. T. Daukes, C.I.E., who had paved the way for a second flight over Everest and had kept the Maharaja informed of developments, so that the latter was already in a position to appreciate the geographic and scientific standpoint of the expedition.

The Legation is situated on rising ground to the north of the city, of a curious but pleasing

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blend of architecture, a mixture of the Swiss chalet with its overhanging eaves, and the battlemented walls of a medieval fortress. It has large gardens which the talented wife of the British Envoy has done much to improve.

Soon after arrival we went to call on the Maharaja of Nepal at his palace. Maharaja Sir Joodha Shum Shere Jung Bahadur Rana, G.C. I.E., Prime Minister and Supreme Commander-in-Chief of Nepal, succeeded to his high office in September, 1932, on the death of his brother, the laws of succession directing that the nearest male relative of the ruling chief shall follow him.

The government and administration of Nepal present a curious anomaly. The Maharaja is the virtual ruler of the country, his word is law, and he controls the machinery of government, whether it be military, political, or commercial. Above him, and yet without executive and administrative powers, is the King, who is rarely seen or heard, and enjoys a mythical sort of existence, a kingship devoid of worry and work, in strange contrast to the usual lot of monarchs.

I had met other rulers in various parts of the

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world, but not a Nepalese one, so there was a distinct spice of romance about the visit. I suppose the world largely imagines that Nepal is a land of fierce warriors who swoop down from their mountain fastnesses armed with their kukris, headed by their ruler as the champion warrior, just the sort of people we read of in the story-books. Actually they are not aggressive but staunch and loyal friends.

Daukes and I motored to the Maharaja's palace, where we were received by a guard of honor at the entrance, the Maharaja being there to greet us. He welcomed me without formality of any kind and with an easy courtesy betokening pride of birth and place. Following the introduction he led the way with a simplicity which is sometimes more alarming than the pomp of a European court.

There were no gorgeously dressed flunkeys to waft me hither and thither, no inquisitive chamberlains to look me up and down and pass me on through innumerable corridors and state rooms. We ascended the grand stairway, the Maharaja conversing in English and pointing out the orna-



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ments that graced it, drawing attention to the painting of the King George's shoot in Nepal when His Majesty visited India for the Coronation Durbar in 1911.

We spoke of this shoot in the Terai arranged by the then Maharaja. Two camps were pitched, the King's shooting-quarters being almost a perfect example of a royal residence in London, with lawns and rose-beds as garden decoration. For more than a year prior to the King's arrival, preparations had been going on. A special road was cut through the railway through the dense forests, a distance of thirty miles, to the camp, while over six hundred elephants were employed for ringing the game.

When the King arrived in the camp he went out shooting almost at once, and the elephant ring had only just closed when a large tiger burst out, with a roar taking a flying leap over a wide stream. As it was in mid-air the royal shikari hit it with a beautiful shot through the neck, killing it instantly.

In the afternoon of the same date the King was out again, and as the line of elephants advanced

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through the jungle, two rhinoceroses suddenly appeared just ahead of his elephant. Although they can move with great speed the King dropped the first with his right barrel, a clean dead hit, and brought the other down with the left, dispatching it with a second shot.

The Nepalese speak with enthusiasm of the King's prowess, and relate how another day he took a right and left at a tiger and a bear as they burst out of the long grass, killing both, each with a single shot. Small wonder that the natives regarded him in the light of a wizard whose eye and aim nothing could escape.

We now went into one of the large drawing-rooms and talked about things in general and the Everest flight in particular, the Maharaja expressing agreement with our plans and giving his approval to a second flight if required.

To facilitate local government, the country is divided into sections, each under its own governor or district official, whose duty is to apply the law and rule the area committed to his charge as the local representative.

The revenue of Nepal is derived mainly from

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the land, the taxation being based on its area and productivity, that in the Terai from its greater fertility being valued at a much higher rate than ground in the hills. Revenue collection is simplified for the tax-gatherer for all he has to do is to go on his rounds armed with a rent roll and a cheerful face. From the proceeds of his collection he is granted five per cent., in addition to being allowed a call on the services of each man in his area for one day per annum. The servant problem is thus solved by this patriarchal system of free service.

The rise of Nepal forms a fascinating chapter in Eastern history, and an object lesson in the art of conquest, with its collective gain. About the time when the star of the Mogul dynasty in India was beginning to set and the American colonists were throwing the taxed tea forced upon them by George II into Boston Harbor, a small but warlike band of adventurers came into Nepal from Central India. They claimed descent from the Rajputs, the military and fighting sect of the Hindus, and had inherited their martial qualities

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from a long line of freebooters and soldiers of fortune, to whom war was a passion.

They settled at Gurkha, a town some thirty-eight miles west of Khatmandu, and there intermarried with the Mongol stock of the country. India was in the melting-pot, ancient dynasties were breaking up, and many of the native states of Hindustan were in transition. The English and French were striving for mastery in southern India and Bengal, with the determined and resourceful English gradually gaining the upper hand and carving out a new empire.

It was a great opportunity for the Gurkhas, as they had styled themselves after their head-quarters capital; and so they, too, determined to set up a new kingdom. Reinforcing their ranks from the martial tribes around them, and by the grant of a liberal share in the spoils of war, they set out on their conquering career, engaging in the most colorful fights in history. They marched over a thousand miles through the Himalayas, laying waste the land and bringing the beaten tribes under their rule. They even penetrated to Tibet,

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invading that country in 1792, besides overrunning Sikkim and Bhutan.

The cradle of Gurkha history lies in that little-known town of Gurkha, now deserted by the ruling race for a more imposing capital. From there the swashbuckling campaigns continued unchecked until they fell foul of the British in the opening of the nineteenth century. Their warlike raids and forays had given them a false idea of their own power and resources, and when the Honorable East India Company, the old John Company, tried negotiations with no effect, war was declared in 1814.

The Gurkha War, in so far as the generalship is concerned, was not an inspiring effort, although here and there are bright individual patches. Three or four generals in succession proved their incompetence, until General Ochterlony appeared upon the scene and by his skilful moves brought the campaign to a close. But if we had won the victory, we had not won the peace; for the Nepalese refused to come to terms and the war had to be renewed. Ochterlony once more took the field, outwitted the enemy in sun-

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dry turning movements, and occupied ground of strategic and political importance with a minimum of loss. The Gurkhas had reckoned without their man and seeing the futility of further resistance, capitulated in March 1816. So ended the Anglo-Gurkha War and from it dates a friendship and mutual admiration that has increased with the passing years.

The treaty concluded between the old John Company and Nepal is of remarkable interest, for under its terms the Gurkhas lost much of what they had gained by right of conquest. Sikkim and Bhutan, as well as Garhwal and Kuman to the north and north-west, were lost to them besides a large part of the Terai; but less than a year later, part of the latter was restored, a friendly and magnanimous gesture which had a good effect.

The agreement between the two sides is of further interest in that it allowed for the creation of three Gurkha regiments for service under the Indian Government. They acquitted themselves so well that gradually other regiments were raised up to the existing number of ten. The mil-

### EVEREST AND ITS MIGHTY NEIGHBORS

In this photograph the summit of Everest is obscured by a cloud. Under the left edge of the cloud lies Lhotse, and Chamlang is to the left and center. Out of this maelstrom of peaks flows a huge ice river with several of its tributaries. This photograph reveals hitherto unknown aspects of the massive rock and ice formations on the southeast slopes of Everest.







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itary service thus open provided an outlet for the martial aspirations of these people, and kept alive the old fighting spirit which has been shown in British interests on more than one occasion.

Prior to the war with the British, Nepal had, as already related, engaged in one with the Tibetans. This excited the anger of the Chinese, of whose kingdom Tibet was a dependency, and they dispatched an army of seventy thousand men to deal with the ubiquitous Gurkhas. The march of this Chinese army across 4,000 miles of plains and forest, and over the highest inhabited portion of the globe, was an astounding performance and probably one of the greatest of its kind in military annals.

The story goes that the Chinese general received his orders from the Son of Heaven in Peking, as the emperor was called; for, theoretically at any rate, he ruled over all beneath the sun, and the nations on the earth were his vassals. The commander-in-chief was given a nondescript army, some vague instructions as to the direction of the enemy and what it was all about, and told to get on with his task.

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### LOOKING TOWARD MAKALU FROM EVEREST

When the airplane was nearly over Everest this picture of Makalu was taken. With its sheer slopes, canyons and ice masses, Everest's sister peak presented an awe-inspiring and dramatic spectacle to the aerial observers.

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His march across Asia without supply, transport, or medical services, is an example of Chinese tenacity and patience. As long as they were in a more or less inhabited area the army lived on the country, but once beyond it it was no longer possible. The general was, however, equal to the occasion. He collected and halted his roving force, marked out the area round their camps into plots; the sword, the musket, and the lance were laid aside, and in their place were taken up the shovel and the plough. Cereals and vegetables were sown, and in the fullness of time the crops were garnered; with renewed supplies the army continued its march until the goal was reached.

So well did the celestial general carry out his orders that he advanced to within a few miles of Khatmandu and forced Nepal to submit to his terms.

In 1854 the Gurkhas again came up against the Tibetans and after a war lasting two years, fought under extraordinary conditions of intense cold and hardship—for operations were carried on at altitudes of fourteen and fifteen thousand feet—the Gurkhas triumphed.

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China this time left the Tibetans to fend for themselves, being preoccupied with internal troubles at home and the menace of flood and famine which have ever been a nightmare to the Chinese. The Gurkhas' terms, imposed and accepted, were the secession of certain territory and the annual payment of 10,000 rupees. We were told a story relative to the question of supplies in this campaign. The Gurkhas being orthodox Hindus could not use oxen for food, since the cow is sacred, but their ruler was a man of resource. Yaks, the oxen of high altitudes, could certainly not be treated as food so long as it remained an ox; so the raj guru, or chief priest, officially declared it to be a deer, so that its eating could be legalized.

But, on the other hand, it looked like a cow and doubtless there was a certain tradition in favor of regarding it as such, and consequently a sacred animal. But in the end, as we have seen, it was ruled that it was not a cow but a deer; and perhaps for a consideration, should ever the necessity again arise, it might be ruled that although not a cow, it is, as it were, a cow.

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The government of this mountain kingdom of nearly six million people is military; indeed, the Gurkhas are one of the most martial peoples in the world, their major occupation is military service both in their own country and in India. The Maharaja rules and controls the army which is formed on the British model and drilled with English words of command, the armament being modern rifles and a light artillery of a highly serviceable character.

Officers and men are dressed similarly to those in the British Army in India, and to see the officers riding up and down the ranks of their battalions, and the Maharaja taking the salute, equipped and clothed as a British general would be, made me wonder if I were not back on the parade ground at Lucknow, or at a march past in Rawalpindi.

During my stay in Khatmandu I was present with the Maharaja at a review of the Nepalese army, held in connection with the coronation festivities, and attended by the leading officials throughout the country. It was a remarkable and practical demonstration of what Nepal can pro-

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duce in a military sense. The march past took place in the afternoon, the Maharaja at the saluting base accompanied by his staff and ministers. The parade ground lies to the east of the city, an extensive grassy plain that, but for the Oriental buildings beyond its edges, might be at Aldershot.

Thirty thousand men marched past, the regiments comprising all the fighting classes of Nepal, mostly infantry, with some brigades of light mountain artillery, the whole forming a force of which the Nepalese may well be proud.

During our stay in Khatmandu we visited most of the famous places, and those intimately associated with the history and life of Nepal. Generally speaking, the buildings in sequestered Khatmandu are ornate, and the main squares, such as those into which the principal streets lead, filled with a bewildering array of palaces, temples and houses, fancifully decorated with wood-carvings and multiple roofs.

Market, or bazaar days, are the time when the people can be studied to advantage, for then the main and subsidiary streets are crowded with

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town and country folk, who come in from the surrounding districts laden with the produce of the field and loom and every kind of indigenous manufacture. All roads lead to the Khatmandu bazaars, and they are thronged from early dawn with a motley collection of men, women and children, making for the area allotted to the sale of particular articles. It is a bright and animated crowd that greets you, all classes from the rich and affluent merchant to the beggar who clamors for alms amid the din of buying and selling.

In the schools realism can be studied with effect. They, in common with most of the buildings, conform to the prevailing essential idea of house construction; the same architectural plan is followed that gives it the appearance of a moral law revealed from heaven, and handed down through all the ages for the architectural guidance of the people.

The children sing whatever is set them for study; for the Oriental treasures the theory that knowledge comes through the ears rather than by the eyes, so that progress towards classical

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honors is in direct proportion to the vocal capacity of the student.

Of the trades and professions that one sees in the streets, perhaps the most lucrative are fortune-telling and letter-writing. The fortune-teller is in constant evidence in the bazaar, while the professional letter-writer is quite an institution. He sits cross-legged with pen and paper spread out upon his knees; clients gather round him and narrate the text of documents, petitions, and letters, and the scribe commits it all to writing. Education being still at a low ebb, the professional amanuensis comes into his own on bazaar days, when the terms of a bargain have to be recorded and deeds of sale drawn up.

Sometimes you may see what corresponds to a tea-shop, in England, where the patrons sit on a floor of beaten mud. The vendor of cakes and sweetmeats is there to supplement the liquids, and he uses his mouth as a purse.

There is a distinct air of cheeriness and goodwill in a Nepalese bazaar crowd; the majority of them toil hard, raising scanty crops in the hills, or tending cattle, but they are genial and hospi-

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table to the few strangers who visit their isolated kingdom.

Much of the merchandise and various articles that are seen coming into Khatmandu are carried on human backs. Women as well as men carry surprisingly heavy loads, usually suspended from a strap across the forehead. A story is current that one woman carried a piano for more than a hundred miles uphill and down dale into the capital, an amazing feat but yet not to be wondered at when one has seen some of the coolies with their burdens.

The roads into Nepal are purposely kept in poor repair, for the Nepalese prefer to discourage visitors and live a life apart. It is said that with the foreigner comes trouble, and with the Bible comes the bayonet. There are, however, as already indicated, a few excellent highways and probably later on these will be increased as the Nepalese become more modern in their ways.

Leaving Nepal, a three days' journey through the hills and the Terai, on foot and pony, by motor and rail, brought me to Delhi, the sacred Moslem city of India, the Rome of the East, and



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the seat of government in the cold weather months from October to April. Legend tells us that Delhi has from time immemorial been the site of a capital city, and there are few places that one approaches with greater curiosity and anticipation.

A few days prior to my arrival, His Excellency the Viceroy had honored us by inspecting both our Westlands and their complicated installations with the greatest interest. Lord Willingdon is to a high degree air-minded, and travels by air whenever possible, recognizing the great future that lies before aviation, especially in India, the land of vast distances which the airplane can encompass with rapidity and comfort.

The Viceroy's house is the outstanding feature of New Delhi, and from it emanates the governing influence, where difficulties are transformed into gain, where prejudices and rivalries are adjusted to the common good, and strong and reliable bricks are made from uninviting straw.

During my stay in this attractive place a reception and dinner were given typical of Eastern splendor and a sidelight on the magic Orient.

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There were enough princes at this banquet to fill a book of fairy tales. Among them was the Maharaja of Bikanir, an example of how English an Indian ruler can be. This polished and cultured gentleman with his perfect command of English lives much like our own royal family. He is in personal touch with his state, treats his subjects of every grade justly, and has hobbies that read like a page of *Who's Who*. A fleet of cars, an arsenal of sporting guns, and an English table with a squad of Goanese waiters are numbered among them.

There was the Maharana of Udaipur who claims descent from the mythical king of Ajodhya and is recognized as the premier Rajput prince. Even in the days long before the Christian era Ajodhya was the court of the great king Dasaratha, the fifty-sixth monarch of the solar line in descent from Raja Manu, so that Udaipur can certainly lay claim to pre-eminence in pedigree.

Back once more in Purnea I found the place a hive of activity, and preparations in full swing

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for tackling the objective. One of the light scouting aircraft had just descended on the landing-ground by Darbhanga House; from a height of fifteen thousand feet the observer had seen the awe-inspiring array of peaks culminating in Mount Everest, and the course they must follow when cruising over the roof of the world.

They would follow the great gorges of the Arun River which cut like a furrow through the Himalayas. With powerful binoculars the gorges were distinguishable, showing countless cliffs of black rock and ice slopes. No Cæsar of India could ever cross these super-Alps, but they act as one of Nature's greatest irrigation reservoirs, storing masses of ice and snow that ultimately become the streams that provide the water and carry the silt which give life to millions of people in the northern plains of India.

## ❖ VII ❖

### The Flying House-Party at Purnea

*Settled in a Maharaja's Bungalow—Cars from a Raja's Garage—Ground Staff Shifted to Lalbalu Aerodrome—Daily Routine—Encounters on an Indian Highway—Bathing-pools and Crocodiles—Polo—Fire-Worshippers as Mess-men—Kite-flying and Petty Thieving—Wriggling Toes as Lie-Detectors—Life behind the Scenes—Mrs. Fellowes as Hostess—Dinner at a Raneé's—The Purdah System—The Call of Veiled Everest*

EVERYONE in India, from the Viceroy downwards, extended towards the Everest Flight the greatest kindness and help. In Purnea the Maharaja of Darbhanga generously offered the loan of his house, refurnishing and fitting it out to the party's requirements, which he and his managerial staff had anticipated with singular success.

The bungalow was a long, single-storied building,

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one room wide, girded with a spacious veranda extending down its length and round both ends. It stood in its own grounds in which was laid out the local golf course; a hundred yards in front was a pear-shaped open space used at first as an aerodrome for the Moths, after some trees had been cut down that rendered landings a little too hazardous to be popular, once the first excitement had lost its novelty. Across the park lay the local club-house with attendant tennis courts, and about a mile away, alone in its glory, the Raja of Banaili's private race-course smiled an invitation. The surroundings, in fact, had the surface aspect of a well-equipped country club that for strictly Asiatic reasons preferred brown clothes to green ones.

The Raja of Banaili, a cheery personality, who had shot over a hundred tigers, offered the fliers his fleet of motor-cars, remarking that, if possible, he would like to retain one or two for his own use. He had seventeen. He seemed astonished, as if at an unusual display of moderation, when only three cars and a lorry were required.

The hospitality of all these friends, truly Eastern in its charm, left everyone very much in their debt.

At first the whole party inhabited the bungalow, or

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adjoining tents, but after a few days it became evident that for the sake of efficiency, the men would have to live on the spot, at the main aerodrome at Lalbalu, with its excellent landing surface, ten miles away. Accordingly, the three hangars for the small and large aircraft, lent by the Royal Air Force, were erected there, and tasks allotted.

The daily routine at head-quarters began with chota hazri, or early tea, at 5.15 a.m. Mr. S. N. Gupta, the meteorologist, arrived about six, with the full weather report in his pocket, a forecast of which had been submitted the previous night. If the advance reading was favorable, Fellowes had, on most occasions, already left to carry out an aerial reconnaissance in the Puss Moth. On the actual morning of the first flight over Everest, Gupta sent up a balloon in an endeavor to secure a definite indication of the wind at the working height required, and succeeded in confirming the report of the previous night. This, and the result of Fellowes' reconnaissance, decided that memorable day.

Breakfast followed the morning meteorological discussion. Those going to the aerodrome would leave at 7.30, and most mornings would be spent preparing in different ways for the star flight, foremost in the

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minds of everyone, or in fitting up and employing various cameras and scientific instruments. Despite delays and postponements, due to variable weather conditions, life at the aerodrome seldom had its idle moments and hardly ever a dull one. The road from the bungalow to the aerodrome, making leisurely in the general direction of Darjeeling, treed and dusty, proved a most popular highway abounding in human, animal and vegetable interest. Jute, sugar-cane, and grass-fields cover the tracts of surrounding country, punctuated by little straying villages, gleaming pools like hollow eyes and trickling water-courses. Owing to the abundant supply of water, no falling off in the numbers of birds or animals occurs, except during the extreme midday heat when one and all seek out the shade of thickets and the denser fastnesses of prickly scrub and jungle.

Every day the men motored out to the aerodrome, passing over this same road that the British soldiers had tramped a hundred years ago.

During the cool hours there streamed along the highway a variegated procession of bullock carts, donkeys, cows, dogs, brown and bony human beings, many of them carrying elderly and almost ancestral

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black umbrellas with which to ward off the rays of the sun, while occasionally across the road's hot dusty surface would dart an inquiring mongoose or handsome scurrying tree rat. Monkeys jumped in the tree-tops, chattering like schoolchildren. Solemn birds clutched branches. Sitting back in a car, the novelty and interest of such surroundings soothed the mind and charmed the eye, a state of satisfying nirvana, often rudely shattered by a grotesquely-hopping, squabbling, group of vultures and carrion crows, hideous sounds of strife receding into the distance, only to be succeeded by the sight of a beggar afflicted with sores, or, more fortunately by a vision of supple, brown figures, swaying rather than walking, each swathed in a single-colored garment flung back from the shoulders, and carrying smoothly and efficiently their luggage on their heads. Their conversation centered on their own small circle of life and death, the crops, and the prospects of the next rainy season.

Conservatism and age-old custom are met with on every hand in India, and among the tribes and races on and adjacent to the border line. The Asiatic as a general rule, does not like rapidity in anything. He

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### AN UNKNOWN TITAN OF THE HIMALAYAS

This great peak of solid rock, rising to a height of 24,000 feet, is the extreme west end of Chamlang and bears an amazing resemblance to Everest. The high altitude photographs, taken at varying angles over territory never before observed from the air, have raised problems which experts will require months to solve.







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prefers his progress to be on slow and dignified lines, and any attempt to force the pace is fatal to success.

A few years ago when Etherton and Blacker were journeying up to Turkistan on a special mission, they took with them a motor-cycle, as the nearest approach to mechanical transport that could be carried across the mountains along the Indian frontier. The appearance in the bazaars of Central Asia of this incarnation of the devil, set the whole population on edge; ponies and donkeys were the orthodox methods of transport. They had carried the people and their goods and chattels since the dawn of history, and the Mullahs were determined they should go on doing so until the end of all things.

Nearly every pool on the way to Lalbalu had its group of half-clad human beings, bathing, fishing in attitudes of resignation, or washing clothes; the latter operation being best described as a practical demonstration of how to break stones by slapping them hard enough with cotton cloth.

Near the aerodrome at Lalbalu, was a large shallow pool, lying in the hollow of a dried-up river bed. This piece of water was afterwards turned into a bathing-pool for the party, with results which if they did not

### THE SOUTH FACE OF EVEREST

In this picture of the great peak, the contrast between the snow field on one section of the mountain and the bleak rocks on the other is dramatically shown. At the extreme left are two gigantic fragments of rock, hundreds of thousands of tons in weight which show, under the stereoscope to be held in their present position largely by the force of gravity. At any time they may crash into the valleys below.

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exactly make history, produced some dramatic and most uncomfortable moments for all of us.

A great deal of mud and reed was cleared away to make the pool fit for bathers, under the supervision of the local executive engineer, who dived in and swam round when all was completed, both by way of declaring the baths open and to show his contempt for the whispered word "crocodile," that had begun to circulate stealthily from ear to ear, though no one apparently was listening. But a few days later the rumor took upon itself the shape of reality when one of the airmen reported that a crocodile head looked at him while bathing. Nobody believed him. Fellowes, however, knowing something of the strength of an Indian fable when it happens to possess two powerful jaws and a tail like a battering-ram, forbade all bathing except in parties of six. The idea, of course, was not that six people should be consumed instead of one, but that there was safety in noise and numbers.

The next day the crocodile was seen again. His existence was now no longer doubted, and it only became a question of time before one of the ground staff shot him with a Rigby rifle. After that morning it was arranged that whenever anyone entered the pool,

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two Indians should swim in first, stick long bamboo poles into the bottom of the pond, watch beside them, and allow no one to bathe except from the safe and shallow end. This duty, the natives were quite willing to undertake for eight annas a day. They also kept on the watch for any wandering crocodiles that might be about, tough leather-skinned customers, traversing the countryside at night and often taking a fancy to midnight bathing. An extra thrill was added to the daily plunge into cool waters, by the thought that there was always the chance they might be harboring an unwelcome visitor. One more representative of the tribe of scaly ones tried to become a member of the aerodrome bathing-club, and was shot for the sins of gate-crashing.

Crocodiles are the bogey-men of India. They are the real footpads of the plains. Snakes, where booted Europeans are concerned, are not one quarter the peril they are generally supposed to be by people who have never visited the tropics; insects do not assume the same sinister importance as in equatorial Africa or the wilds of South America; meetings with tigers, and man-eating panthers, can be left nowadays to the hunter and the lonely forest officer; but always,

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wherever there is the presence of water and the sweep of rivers across parched and thirsty plains, the menace of the crocodile remains. There are travelers' tales of these ubiquitous saurians that match the long-bow stories of any fisherman. To many of the crowding millions of Hindustan they have become almost legendary figures, guardians of temple secrets, and of the spirits of the dead. It is said of them that a certain species burrow deep into sandy banks and river mud, remaining there happily for months and sometimes years, waiting for torrential rains that bring them out by thousands to terrorize the local villages, while they make up for their long period of fasting.

Whatever fancy may concede to these lurking monsters, the facts themselves are strange enough. A crocodile has five fingers and four toes and can bellow like a bull. His stomach is small, but his digestion so powerful that every bone of his victim is dissolved while still being stowed away in his gullet. By means of a fold in his tongue, pressing against the roof of his mouth, he can breathe comfortably through his nose while the whole of his mouth gapes open under water; birds act as his obliging dentist, free of charge, and a buffet from the tail of one of these fully-grown

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reptiles can knock an unsuspecting man into the water.

Altogether, a crocodile is a most unpleasant sort of neighbor in a swimming-pool. Englishmen in India, particularly army subalterns, sometimes indulge in the sport of crocodile-fishing. A large bait, the more putrid the better, is thrown into the river on an anchor attached to a steel hawser or strong rope and, when the beast is hooked, there ensues a tremendous tug-of-war. Two strong sticks tied crossways will often serve the purpose of steel hook, since the jaws of a crocodile, like those of a bulldog, never willingly release their prey.

This sport was first referred to in one of the oldest writings of man, the Book of Job:

Canst thou draw out leviathan with an hook? or  
his tongue with a cord which thou lettest  
down?

Canst thou fill his skin with barbed irons? or his  
head with fish spears?

Lay thine hand upon him, remembering the battle,  
do no more.

Only those who have tried their hands at this form

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of sport in India know the truth of the old chronicler's graphic remarks.

Besides bathing, the other great form of recreation at Purnea and Lalbalu aerodrome was polo. This was played on sturdy Bhutiya ponies with a sprinkling of Walers and country-breds. Polo is part and parcel of Indian life, and one of the great attractions of a country that has mothered and fathered the sport for centuries, sending in the course of time the challenge of her supremacy across the seas to the Argentine and the United States. It is said that Baber, poet warrior, and first Mogul emperor, brought the game with him out of Central Asia to temper his many stern activities with a little recreation. The Moguls, who had need of resolute quick-witted men, of men of resource, found that polo revealed the character of the players, tried their courage, and control, and proved their fitness, or otherwise, for the strenuous life of those times. Hence skill at polo became a passport to imperial favor and advancement at Court.

The true inwardness and waywardness of this noble game, its origins and scope, and its influence on the different nations of horsemen, after the manner of fox-hunting as applied to Britain, makes a fascinating



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theme for discussion. Polo holds pride of place as the oldest stick-and-ball game in the world. Beside it, golf and cricket are mere children. Long before Hurlingham was anything except a meeting-ground for painted savages, and Meadowbrook the haunt of red-skin and bison, polo flourished in the East. Probably the earliest records came from Persia where it was played as a highly organized four-a-side affair, corresponding to Gilgit polo in India at the present time. The Tibetan word "pulu" means a ball. China had its own special blend, 600 years B.C., with a wooden ball and a suspended bag for goal. The Turks of Stamboul used racquets instead of sticks. In Japan, ancient feudal custom still survives in a game played with a paper ball covered with bamboo fibre and directed into round goals with sticks shaped like a racquet. The sport as played in olden times, with no limits to the numbers of riders engaged on each side, must have developed sometimes into little short of a pitched battle.

At Purnea, one of the mightiest exponents of the game was Tom Smith, an indigo planter. Tom was big and hearty, with a voice that could be heard all over the country. To see him riding his tiny Bhutiya

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pony, his legs almost trailing on the ground, his face wreathed in smiles, was one of the most cheerful sights imaginable.

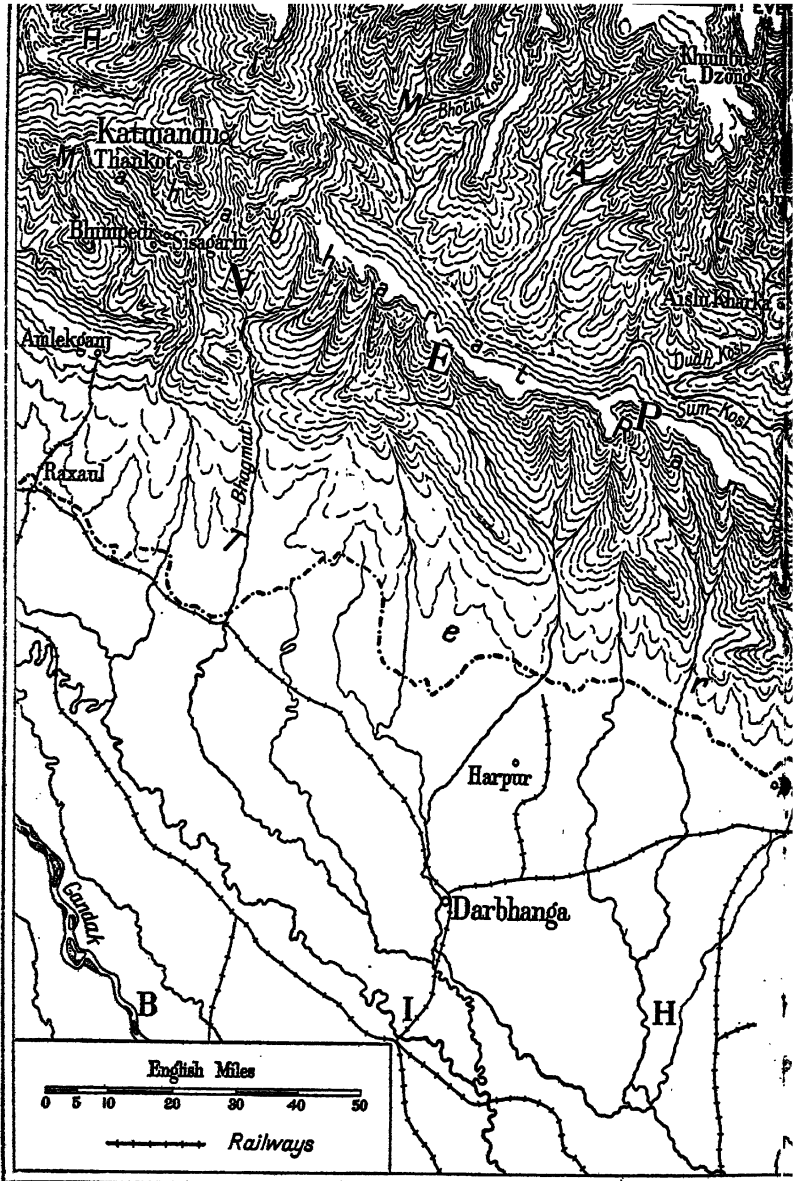
Tom Smith was the kind of man who should have a book written about him by an attendant Indian Boswell. His words are worth keeping.

Most mornings Tom came over to Darbhanga House at daybreak, his voice awakening all sleeping figures in the bungalow. He was the John Peel of Purnea, and a human alarm clock.

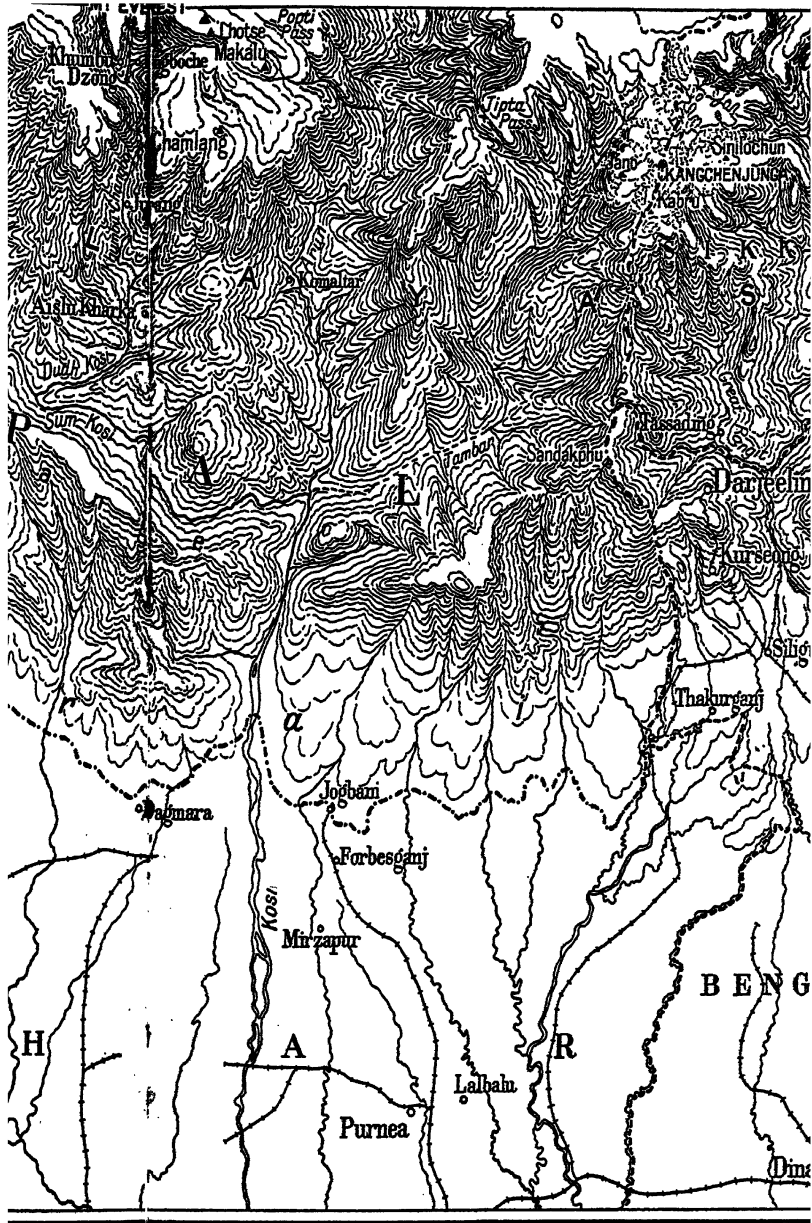
His wife, too, was one of those people without whose help the expedition would have missed a great deal. A model of efficiency, she took the whole party under her wing and superintended the entire commissariat, for her knowledge extended everywhere from how to stalk a tiger to the making of a chocolate soufflé. The two mess-men, subordinate to her orders, were Parsees—Framjee and Golwalla—both exceedingly proud of their ancestry and the ancient sect of fire-worshippers.

According to Framjee there are a quarter of a million Parsees in the world, and their religion aims nowadays more at physical and material than spiritual welfare; he cited their rules as to bathing, physical





TO SHOW THE FLIGHT FROM LALBAH





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exercise, and mature age for marriage, as proof of this. Parsees attach special importance to benevolence. The last ten days of each year are supposed to be devoted to acts of charity and philanthropic deeds.

It is not uncommon on the fighting frontiers of India to have murderers for servants. Blood feuds are numerous and knife-hands quick. In some Pathan villages a man is not thought much of until he has taken life. A cynical critic once asked how many murders went to make a transborder Moslem of the north-west frontier, but he was hardly being fair to a conservative and, on the whole, law-abiding race of fighting men.

In places like Purnea the most important people are the money-lender and the barber. The one is the local Lloyds; the other, who caters for marriages, the Lyons of the district.

Villages are full of kite-flying enthusiasts; broken glass and bottles often adorn the strings, to cut the opponent's line when possible. Pie dogs slink by day; plump little children trace fingers of fate in the dust.

One day at the bungalow, a dog sneaked in and ran off with a joint of meat. Some silver knives and forks were unaccountably missing at the same time,

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members of the staff maintaining that the dog was responsible; but Etherton, who was once an examiner in Hindustani and knew the language intimately, soon disabused them of this idea. Magically, in their appointed places, the lost cutlery returned to the table; the servants, grave as the Sphinx, declared that the dog had produced them again.

Another time a native witness was suborned in a case of petty theft. Etherton ordered the man to take his shoes off and stand on the veranda when answering questions. Then was seen the wisdom of the initiated, for Etherton has a theory, the truth of which he has often proved, that few natives can keep their toes still if they are telling a lie. This is an idea that, provided the secret judgment remained well kept, might be extended with success to police courts.

A classic story is told in the East of how a thief once stole a house. Hearing that a newcomer had recently come to live in a certain town house that he coveted, the thief took careful stock of the place, both inside and out, and then went before the magistrate declaring that the house was really his, and the newcomer the father of lies and an interloper. He produced various false documents, in support of his claim. The



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judge, tiring of the lengthy proceedings, decided, as he thought quite justly, to make the two claimants describe the interior of the house in detail, so that the true owner might at once be apparent. But the unjust thief was so much more correct and accurate in his answers than the rightful occupant, that he obtained the verdict.

The bungalow of the fliers soon became a center for all kinds of comings and goings. The food problem, especially the feeding of those at the aerodrome eight miles away, developed into an intricate business; Ellison, one of the reserve pilots, was appointed transport officer, fulfilling his duties with a cheerfulness that soon supplied the oil for the wheels of communication to run smoothly.

Then there was Sayid Ali, whom Etherton put in charge of stores and expeditionary gear. Sayid Ali came from Blacker's regiment, the Guides, one of the few corps in India that has a permanent home. There they keep all the family heirlooms from trophies of the chase and the loot of war down to Buddhist statuary. There is a swimming-bath in the garden of the officer's mess and a huge wire and muslin contraption that looks like a gigantic meat safe

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in which breakfast is taken during the hot weather free from the flies.

They say that the Guides are recruited from the pick of the fighting races in India, and you can see them strolling about the lines in enormous baggy trousers with the light of battle in their eyes. It is their home as it was that of their fathers, for the militant clansman puts his son's name down for the Guides as Englishmen put theirs down for the Senior.

There is something distinctly alluring about these North Indian and frontier Moslems. They are so jovial and devil-may-care, so independent and so hospitable and courteous on occasion. With them fighting is a passion, and those beyond the frontier are always challenging the authority and strength of the British forces, and when not engaged in fighting a common enemy they quarrel among themselves. The tribes of these rugged mountain areas are continually on the lookout for an opportunity to descend from their rocky fastnesses into the plains to plunder and kill. To them war is both a business and a pastime.

But, back to Purnea, where native peddlers and mendicants paid their calls and tried to sell their goods, squatting upon the veranda. At first they were

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all smiles and self-sacrifice, but the moment anyone picked up one of their wares, the sound of bargaining would fill the air and go on until sunset if not stopped. Where trade is concerned in the East the sun stands still. Time is the vulture who never alights save on the dead. A clock tower in the bazaar is like the hyena who raises his voice in the night when no one bothers to listen. Naturally, when a native says he is going to the bazaar, he does not mean he is going to buy anything, but merely to lounge, bargain, and above all to gossip. "Tell me a story, and then let me tell it better," is ageless in the East as anywhere else.

Once, on the way from the bungalow to the aerodrome, a monkey passed riding on a bullock! Everyone made way for the monkey and his mount, and motor-cars braked reverently; for Hanuman, the monkey god, is a sacred person to Hindus. When he crossed from India to Ceylon he did it in one stride, and where his foot touched earth in India a temple marks the holy spot.

There were horse races in which the airmen numbered themselves amongst the "also ran"; for they rode on Bhutiya ponies, which, like Nicholas Nickleby, are notorious for their straight legs. When off

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the race-course they have an ambling pace quite foreign to the trot as we understand it. You just sit still in the saddle and shiver along, as the monks of medieval England must have done when they left their abbeys to ride to London.

A peep behind the scenes at the bungalow, except during the hours of ease and recreation, would have revealed much the same routine work going on every day; for each one of the expedition had his own special place in the general scheme of operations.

Mrs. Fellowes could be seen on the veranda writing up her diary or being consulted on some social point. Her judgment, more particularly during the week of telegraphic warfare over the second flight, was often sought with regard to tempering the asperities of this unfortunate correspondence. Bennett and Ellison would be found in consultation about the food question and the camp at the aerodrome. At the next table would be sitting Clydesdale and McIntyre working out some navigation problem, with Blacker tearing himself away from preoccupations over photography to interject fresh suggestions. McIntyre was the navigation expert and Clydesdale constituted himself general critic of all navigational and photographic

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schemes, prior to their adoption. Barkas was the filming expert, and Fraser, an R.A.F. man, superintended the photography. Inside the bungalow, Shepherd would be preparing his next dispatch for *The Times*, while Etherton held a palaver with local residents whose assistance had been invoked upon some vital matter. Fellowes had his office in his dressing-room, where Gearing held sway, and from there the former emerged when not at the aerodrome, to play his part in the shaping of events. Preparations thus proceeded apace, working up by definite stages towards their climax.

In the heat of the afternoon either sleep or bathing generally claimed the party. Tea came at 4.30, and then the conference on the next day's film activities, with Barkas in the chair. The difficulty, always uppermost in these screen discussions, was that if the weather became suitable, the film programme had inevitably and instantly to be cancelled in favor of flying, the primary aim of the expedition; in fact, members of the party who had no leanings towards becoming film stars, could never be made to realize how lightly they were let off in the matter of repetition and rehearsal of scenes. Naturally they were

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reluctant, as good pilots, to leave their machines in the sun for long periods, or to start up the powerful engines of the big aircraft unnecessarily. Geoffrey Barkas, too, had his work affected by limitations in the field of insurance and gasoline; but he made the best possible use of the available material and afterwards reaped the harvest of his reward.

A full stop and usually a finish was put to these excursions and discussions by the arrival of Gupta bringing the evening meteorological report. As a general rule this was a dissappointing one, dealing with boisterous winds or cloudy conditions in the upper strata of the air.

Once or twice there were dinners with a local raja and his wife in the privacy of their home. The rane conducted her house like an English woman, and is probably regarded by her own people as almost a foreigner. This cultured lady is an exception among the women of India, for they have no official position in either the Hindu or Moslem religions. But many a strong-minded wife or mother-in-law governs the family from behind the purdah curtains. In the world outside the home, the age-long devices of harem in-

### THE CONQUERORS OF EVEREST

This photograph was taken just after landing from the first flight over Everest. The observer is still in his cockpit while the other flyers, still wearing their electrically heated clothes, are discussing incidents of the epoch-making flight. One of the observers is showing where his oxygen pipe broke when the plane was over Everest. From left to right the men are: Colonel Etherton, Expedition Secretary; Lord Clydesdale; Air-Commodore Fellowes; Colonel Blacker (in plane); Flight-Lieutenant McIntyre; and Photographer Bonnet.







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trigue have failed the Indian woman and she has not found a new technique.

Several women are members of the legislative assemblies, it is true, and in the larger cities some have been elected to the local councils; but caste-bound men are afraid to take a woman's advice in public, whatever they may do in private.

This purdah system leads to some amusing scenes. When one of our party was a magistrate in India, a woman had to give evidence in a family land dispute. First of all a palanquin completely veiled, was placed in the hall of her home. Into this she popped when the coast was clear. Then the bearers came in, took her up and bore her into court. There the Brahmin barristers and disputants were asked if they were satisfied that she was the woman required and not some other person. At this they advanced to the litter, muttered a few words through the curtains, and then assured the judge that the case might proceed.

Women in harems are as carefully protected from light as though they were so many photographic films. They live in their special quarters under charge of senior ladies, one of whom attends the wife whenever she goes out in the screened car or carriage.

### 100 MILES FROM THE HIMALAYAN RAMPARTS

Seen from a distance of 100 miles, the massive peaks of the Himalayas rise above the clouds like islands in the ocean. This remarkable infra-red photograph is one of the most striking which was made during the expedition.

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In discussing that strange mixture of contradictions, the Indian woman, it must be admitted that education has never been denied her. It is a sacred tradition that Hindu women should, as far as practicable, receive an education on a level with that of their men-folk, and one of the most notable of ancient Indian poets was a woman. Most Indian women seem content with their life. Deeply conservative, they prefer to exercise their influence on public affairs through their husbands rather than through the ballot box.

These and other topics were discussed when the long Indian day had blazed itself out, and evening came with a soft breeze stirring the creepers in the trellis-work. The pale moon rose streaming through the trees in the stillness of a tropical night broken occasionally by the drumming of distant tomtoms or the barking of a village dog. The members of the flying house-party would often turn their eyes, in the words of the psalmist, towards the hills, and to the beckoning white mountains that lay beyond. The tallest of them beckoned more persistently every night. Was the Goddess of the Mountains to remain indefinitely in Purdah?

## ❖ VIII ❖

### The Great Adventure

*The Baffling Wind—An Auspicious Monday—Last Minute Preparations—All Aboard for Everest—Blacker's Account of the Flight—His Forty-six Duties as Observer—A Dust-curtain 9000 Feet High—Everest Leaps into View—Incomparable Whiteness of the Snow and Blue of the Sky Above—A Drop of 2000 Feet—Caught in the Plume of Everest—Pilot Clydesdale's Version—The Giant Reached at 10.05 A.M.—Cleared by Only One Hundred Feet—Back to Earth in an Hour*

A SENSE of the great prize at hand dominated their efforts; all were so ardent, our leader so confident, the need of securing good results so clamant, and a decisive victory over Everest seemingly so near, that only doubts as to the weather conditions clouded their thoughts. The work and preparation of more than a year which had continued at high pitch seemed likely to be crowned with success.

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But always the wind and the weather governed their deliberations. Whenever the clearness of the sky allowed the theodolite observers to see the balloon up to 25,000 feet and above, the wind velocities became alarming, and seldom under seventy miles an hour. Previous official estimates showed that a thirty- or possibly forty-mile wind to be the highest in which it would be safe to make the attempt.

It will be understood that a strong wind from the west, its usual quarter, would tend to make the machines, traveling from south to north, drift sideways out of their course. Steering into the wind to counteract this, would be equivalent to flying a longer course, and hence burning more fuel. Thus the stronger the wind "at height," the more fuel burnt.

It was a question, therefore, if the attempt were made in a stronger wind than that specified as permissible by the experts, whether there would be sufficient for the return journey. As a precaution, an advanced landing-ground was prepared near Forbesganj, forty-six miles north of Purnea.

They anxiously waited day by day for the wind at 30,000 feet to drop to a reasonable figure. Sometimes, when the wind speed seemed promising, the moun-

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tains would be covered in cloud, a matter fatal to photography. They could not even afford to have the valleys on the southern slopes of Everest cloud-filled, as this would cause a gap in the continuity of the all-important strip of air survey photographs.

In April the weather at Purnea seems to go in ten- or twelve-day cycles. It starts with a "disturbance," which might be a storm of rain. Then there are several clear days with little wind, but characterized by cloud-caps on the mountains. As these cloud-caps melt away and the peaks stand out clear, the wind speed appears to rise. Every morning one of the scouting Moths would go up to a few thousand feet, at which height, the three great mountains were always clearly visible and it could be seen to what extent they were free from clouds. They had to wait repeatedly for the evening telegram from Calcutta, with its weather forecast, and then for the early morning reports from the scout pilot, and the balloon observers. Would they never get a moderate wind, without a mass of cloud? All seemed to depend on this. The weather factor had become a much greater one than anticipated.

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Over and over again they debated the start, always with the able advice of the meteorologists.

Friday of that memorable week came, then Saturday. The wind reports showed great, but diminishing velocities. On Sunday the speeds had lessened. They could scarcely sleep from suspense. The evening telegram foretold a still further drop. Would it be borne out in the morning? Would the clouds have gathered or the pendulum swing again back to greater winds? It was decided that the risk must be taken of flying in a much higher wind and watching the fuel consumption carefully.

Then came Monday, an auspicious day, so said the astrologers. The scouting Moth reported the mountain crystal-clear, the meteorologists gave a wind of fifty-seven miles an hour at the altitudes—not so high as to stand in the way of an attempt on Everest.

The die was cast; they drove breathlessly the ten miles to the landing-ground and fretted and fumed at the manifold last minute preparations.

There were a hundred tasks to complete before the big machines were ready for the flight. Everything possible had been done the night before, but a number of details had to be left to the last minute.

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Chief among the preparations was that of the cameras. Dust, fine, impalpable, all-pervading, was everywhere. For this reason the cameras could never be left at the aerodrome, still less in the machines themselves. In fact, it was found necessary to clean thoroughly every one of the numerous delicate items of camera equipment each night, and to wrap them up in a double layer of newspaper before putting them back, each in its proper chest. Even these precautions were not excessive, but the result was that nearly an hour's hard work devolved on the aircraftmen every morning, work which had to be done with great care and with the accuracy of the scientific instrument-maker.

In addition to the fitting of the photographic equipment, there were many other minor tasks which could not be done the night before. Even the actual man-handling of the machines out of their tents took something like twenty minutes, so that it was not till after eight o'clock that the two aircraft were lined up in the aerodrome ready to take off.

The fliers lowered themselves into their machines with difficulty, sweltering already in the heavy suits. The engines were ticking over and running as

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smoothly as could be; then, after a few final words with the leader and Etherton, who handed up the Everest mail containing letters to be carried over the mountain, the pilots opened the throttles, the huge engines roared, and with a cheer and a wave they were off on the great adventure.

In the "Houston," the pilot was young Lord Clydesdale; the observer, Colonel Blacker; in the "Wallace," the corresponding posts were held by Flight Lieutenant McIntyre and S. R. Bonnett. Now let Blacker, the chief observer, tell the story in his own words:

A few minutes after we left the ground I had to busy myself with my routine duties. At the start of all high-altitude flights, a number of vital checks must be made, and to avoid the chance of omitting any, I had compiled a list. No less than forty-six separate jobs were included, and though each one was trifling in itself, none could be omitted without risk to the eventual success of the work. It was the more necessary to prepare such a list because we were inhaling oxygen the whole time, and one of its effects on the human mind seems to be to create a tendency to concen-



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trate on the idea or task that is uppermost to the exclusion of everything else. As most of the forty-six tasks were small details, it was all the more necessary to have them down in writing so that each observer could consult his list at any particular time during the flight, and thus insure that every piece of work had been done at the appropriate time. The whole flight might well be ruined, for instance, by the failure to remove the caps from the lenses of all the cameras; and in this dusty climate they had to be left on till the last moment.

The leading aircraftman photographer was responsible in the programme for removing all these caps, counting them and reporting to the observer the moment before the chocks were removed from the wheels.

Everything passed off without incident as the two great machines soared up through the haze over the brown plains, except that just for a moment the dynamo refused, as electricians put it, to build up. This is a temperamentality to which all dynamos are liable. So, almost in a panic, I had to take off the cover of the cut-out of the elec-

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trical system, undo the screws with my thumb-nail, pressing the platinum contacts together by hand. All was well, the generator now continued to behave perfectly throughout the flight, and a supply of current kept us warm from first to last.

By the time the initial batch of these tests was completed we had been flying for some ten minutes, and for the next half-hour I had nothing to do but to sit conning over and recapitulating in my mind my duties. This part of the journey was the more humdrum because the plains and foothills below were almost lost to view owing to the thick dust-haze which had, unfortunately, on that day, chosen to rise to a phenomenal height. Gradually the dull monochrome of the brown checkerboards of the ploughed fields of Bihar fused together into a uniform carpet, and every now and then the cluster of tiny rectangular roofs of a village stood out from the scene.

This haze almost invariably ceases at about a 5,000 or 6,000 foot level; in the present case its continuance above that height was infuriating to the last degree.

We did not rise clear of it until actually about

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9,000 feet, and so the southern ground control, which was the river confluence near Kamaltar, was practically invisible to the pilot. He could not find it with sufficient accuracy, a decided misfortune, since it was the point from which the photographic survey was started.

Nevertheless, I was just able to see an infinite tangle of the brown mountains of Nepal, seamed with black forests, and caught occasional glimpses of the swift Arun river in its gradually steepening valley, as now and then I opened the hatchway of the floor and looked down through thousands of feet of purple space. We crossed the frontier of this forbidden kingdom at 13,000 feet. Then, suddenly, a little after our craft sprang clear of the haze into the wonderful translucent air of the upper heights, away to our right an amazing view of Kangchenjunga in all its gleaming whiteness opened out against the blue.

For a few minutes nothing could be seen against the sky but this.

Fumbling with the catches in my thick gloves, I threw up the cockpit roof, put my head out into the icy slip-stream and there over the pulsating

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rocker arms of the Pegasus, showing level with us was the naked majesty of Everest itself. Just a tiny triangle of whiteness, so white as to appear incandescent, and on its right, a hand's breadth, another tiny peak which was Makalu. For some time nothing could be seen above this purple haze but these three incredible white peaks—Everest and Makalu just to the right of the engine, and Kangchenjunga behind the right wing. It was fortunate that the wind from the westward caused the machine to lie with a drift of eighteen degrees, obliquely to our track to the mountain, and thus we had a clear view of our goal straight beneath a point on the undersurface of the upper wing, eighteen degrees from the centre line.

Gyachungkang was maskd by the engine, but soon Gaurisankar showed over the port wing.

I was not long able to remain watching these wonderful sights; for soon the machine soared upwards, unfolding innumerable peaks to right and left and in front, all in their amazing white mantles, but scored and seared with black precipices.

The light on the snow was a wonderful thing

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in itself. A quality of whiteness, as much more brilliant than the snow to which ordinary human eyes are accustomed, as that snow is more vivid than the unclothed landscape.

Somewhat to our dismay, there streamed from the crest of Everest away towards its sister peak, Makalu, eastwards, that immense ice-plume which is the manifestation of a mighty wind raging across the summit. Lifting from the prodigious cliff face, countless particles of ice are driven over the summit with blizzard force.

Soon, very slowly it seemed, we approached closer and closer to the big white mountains, and all my time became occupied with work on the cameras.

Now I crouched down over the drift-sight, peering through the great concave lens and adjusted the wires across it. I rotated them carefully and this gave me the angle of drift of eighteen degrees. I passed this to the pilot, who needed it for navigation and then I adjusted the big automatic survey camera, turning it through the same angle in its mounting.

I had to look to the spirit-levels, longitudinal

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and transverse, and to adjust the tilt of the camera in both senses, until the bubbles rested in the middle of their travel. This required delicacy and judgment as the machine swayed every now and then. The adjustment had to be made in each case just at the moment when the machine happened to be level, neither one wing-tip up nor down in either direction nor pitching. I glanced at the big aluminum actuating-knob, and saw that after twenty seconds or so it turned by itself as the pilot had switched on the current into its motor. The camera was warm, the current was running through it, and all seemed well.

Now, without getting up from a prone position, I could move myself back a little on my elbows, open the hatchway in the floor, and look vertically down on the amazing mountainscape, bare trees, seamed with great glaciers, and interspersed with streaks of scree and shale. This was the beginning of the range, insignificant enough to our eyes at the height we were, which rises up to the culminating 24,000 foot peak of Chamlang. Then shutting the hatchway and, laboriously taking great care to keep the oxygen pipe

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unentangled and myself clear of all the various electrical wires, I could stand up and look again through the top of the cockpit. I caught a glimpse over the pilot's shoulder of the brilliant red light on his dashboard, which flashed for a moment as the camera shutter operated itself.

Up went our machine into a sky of indescribable blue, until we came to a level with the great culminating peak itself.

Then, to my astonished eyes, northwards over the shoulder of the mountain, across the vast bare plateau of Tibet, a group of snow-clad peaks uplifted itself. I hesitated to conjecture the distance at which they lay in the heart of that almost trackless country; for by some trick of vision the summits seemed even higher than that of Mount Everest. The astonishing picture of this great mountain itself, whose plume for a moment seemed to diminish in length, and with its tremendous sullen cliffs, set off the whiteness of Makalu, was a sight which must for ever remain in one's mind.

I had been hard at work with the cameras first exposing plates, uncapping dark slides, winding

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and setting the shutters to seize a series of splendid views. The scene was superb and beyond description. The visibility was extraordinary and permitted the whole range to be seen on the western horizon. It seemed that the only limit to the view along the mountain was that due to the curvature of the earth's surface. The size of the mountains stunned the senses; the stupendous scale of the scenery and the clear air confounded all estimates of size and distance. So I went on, now exposing plates, now lifting the heavy cinema camera to run off fifty feet or so of film. I crouched down again, struggling to open the hatchway, to take a photograph through the floor. Everything by now, all the metal parts of the machine, was chilled with the cold, the cold of almost interstellar space. The fastenings were stiff and the metal sides had almost seized. I struggled with them, the effort making me pant for breath, and I squeezed my mask on to my face to get all the oxygen possible. I had to pause and, suddenly, with the door half-open I became aware, almost perceptibly, of a sensation of dropping through space. The floor of the machine was

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### CIRCLING THE WORLD'S HIGHEST MOUNTAIN

This photograph was taken while the plane was riding the swift and treacherous winds that are always blowing across the summit of Mount Everest. In the background rises Makalu. Directly in the foreground is the bleak summit of Everest showing its northerly face. The white haze in the center of the picture is Everest's snow plume.







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falling away below us. I grasped a fuselage strut and peered through my goggles at the altimeter needle. It crept, almost swung, visibly as I looked at it in astonishment, down through a couple of thousand feet. Now I had the hatchway open and the airplane swooped downwards over a mighty peak of jagged triangular buttresses, which was the South Peak.

Below us loomed an almost incomprehensible medley of ridges, ranges and spurs of black rocks, with here and there the characteristic yellowy-red of Everest showing through. We had suddenly lost two thousand feet in this great down-draught of the winds, and it seemed as though we should never clear the crags of the South Peak on the way to Everest now towering in front of us. However, the alarm was short-lived, for our splendid engine took us up through the great overfall. Again we climbed; slowly, yet too quickly for one who wants to make use of every moment, our airplane came to the curved chisel-like summit of Everest, crossing it, so it seemed to me, just a hair's breadth over its menacing summit. The crest came up to meet me as I crouched peer-

### EVEREST'S MAJESTIC NEIGHBOR

Makalu is the second highest peak in the near neighborhood of Everest and from the Nepalese border it looks higher than Everest because it is closer. As yet no attempt has been made to climb this formidable peak.

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ing through the floor, and I almost wondered whether the tail skid would strike the summit. I labored incessantly, panting again for breath to expose plates and films, each lift of the camera being a real exertion. Every now and then my eyes swam a little and I looked at the oxygen flow-meter to find it reading its maximum. So I bethought myself of the little cork plugs I had whittled down to fit the eye apertures of the mask. Tearing off the heavy gloves and fumbling with cold fingers, I managed to stuff them in.

Now I had worked my way up again to a standing position, with the cockpit roof fully open and its flaps fastened back. I had my head and shoulders out into the slip-stream, which had become strangely bereft of its accustomed force. I was astonished for a moment till I suddenly remembered that the wind here only weighed a quarter as much as at sea-level. Now I could take photographs over the top of the machine much aided by these fortunate cork plugs. Without them, if the aviator has his head sideways in the slip-stream, the oxygen tends to be blown from his mask and the flow stopped before it can

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reach his mouth, in much the same way that a trout may be drowned by pulling him upstream against the lie of his gills.

Thus almost, before indeed I expected it, we swooped over the summit and a savage period of toil began. The pilot swung the machine skilfully again towards the westward into the huge wind force sweeping downwards over the crest; so great was its strength that, as the machine battled with it and struggled to climb upwards against the downfall, we seemed scarcely to make headway in spite of our 120 mile an hour air speed. I crammed plate-holder after plate-holder into the camera, releasing the shutter as fast as I could, to line it on one wonderful scene after another. We were now for a few moments in the very plume itself, and as we swung round fragments of ice rattled violently into the cockpit.

We made another circuit and then another as I exposed dozens of plates and ran off my spools of film. We could not wait long over the mountain-top for the oxygen pressure gauge needle in my cockpit was moving downwards, an ominous sign. We had no very exact idea of the length

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of time our return journey would take with that violent wind blowing, and fuel was needed for emergencies. After a quarter of an hour or so, which seemed perhaps on the one hand like a lifetime from its amazing experiences, and yet was all too short, we turned back. Soon we saw this wonderful view with serried peaks, row upon row, in fairy beauty, surmounted by Everest and Makalu almost grotesquely outlined by the aluminum-colored fabric of our rudder. We came back towards the terrific Arun Gorges over a bewildering medley of peaks, ranges and spurs, interspersed with broad grimy glaciers littered with moraine, scree and shale. These peaks must be a great height and yet they seemed insignificant enough to our eyes.

The one hundred and sixty miles home passed surprisingly quickly, the journey marred by the discovery that the second film in the ciné-camera had become frozen despite its warm jacket, and was so brittle that I could not reload. My oxygen mask, too, plugged as it was with cork stoppers, had become a solid mass of ice. Steadily we came down, gradually losing height, with

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the throttle of the engine fairly well open to guard against the carburetor freezing. It was with another struggle that I managed to change the magazine of the survey camera and adjust it to the drift now coming from the opposite side of the airplane.

Soon the semicircle of gleaming peaks faded from our sight as the straight line of purple dust-haze rose to overwhelm it.

So much for the chief observer's record. The pilot and he had no communication during the flight, their positions were several feet apart, there was a bulkhead between them and their telephone had not been in an accommodating mood. Clydesdale was therefore in a position to form his own impressions independently, and we cannot do better than quote his report verbatim:

This morning the Indian Meteorological Officer at Purnea, Mr. S. N. Gupta, whose information and advice have been of great value to the expedition, reported from balloon observations, that the wind, whose velocity previously had been unsuitable, had dropped to fifty-seven miles per

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hour at 33,000 feet, which altitude we had decided would be the most suitable working height for photographic survey.

Our two machines took off from Lalbalu aerodrome, near Purnea, in still air, the Houston-Westland crewed by Col. L. V. S. Blacker and myself, and the Westland-Wallace piloted by Flight-Lieutenant D. F. McIntyre, with S. R. Bonnet, who is aerial photographer of the Gaumont-British Film Corporation, as observer. Our direct route to the summit meant flying on a track of 342 degrees. This necessitated changing the compass course at intervals more to the west, on account of the increase of wind velocity with height, according to our weather report.

We had relied to some extent on overcoming the difficulty of accurate compass navigation caused by this frequent change of wind speed, by the good landmarks near and along the track.

A heavy dust-haze, rising to a considerable height, almost completely obscured the ground from Forbesganj towards the higher mountain ranges. This, as it proved later, made aerial survey work impossible. We climbed slowly at low



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engine revolutions to a height of 10,000 feet. By this height, the crews of both machines had tested their respective electrical heating sets, and McIntyre and I signalled to each other that everything was satisfactory.

After thirty minutes' flying we passed over Forbesganj, our forward emergency landing-ground, forty miles from Purnea and at a height of 19,000 feet. Everest first became visible above the haze. We flew lower than our intended working height in order to make every endeavor to pass over Komaltar, close to which is the ground control from which we were to begin our survey. It proved impossible to identify any landmarks at all until approximately within twenty miles of the summit.

At nine o'clock we passed over Chamlang at an altitude of 31,000 feet. On approaching Lhotse, the southern peak of the Everest group, the ground rises at a steep gradient, and both machines experienced a steady down current due to deflection of the west wind over the mountain, causing a loss of altitude of 1,500 feet, despite all our efforts to climb. Both airplanes flew over the

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summit of Everest at 10°5., *clearing it by 100 feet.*

The wind velocity was noticeably high near the summit, but no bumps were felt by either aircraft. Fifteen minutes were spent flying in the neighborhood of the summit, and on account of the smooth flying conditions the taking of close-range photographs was rendered possible.

The visibility of distant high peaks was very good. The great Himalaya range could be seen extending to great distances and provided a magnificent spectacle.

The return journey was carried out at a slightly lower altitude, so as to secure better conditions for oblique photography. The machines landed at Lalbalu at 11.25. Both pilots pay the highest tribute to the splendid performance of the engines and aircraft. So we landed, full of happiness, with the realization that we had been where no man had been before.

“But soon our jubilation was marred by the discovery that the survey photographs were not a success. That phenomenally amazing haze of dust had obscured the lower mountains to such

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a degree that the strips of photographs would neither overlap nor show the ground controls near the Komaltar ridge.

The actual flyers were tired and entranced by their experiences and by what they had seen, to the point of exaltation, so it took some time for the situation to be accurately appraised. In fact it was not until the next day that we were able to pin together the hundred prints from each film. Meanwhile the letters we had carried over the mountain were despatched to H.M. the King, the Prince of Wales and Lady Houston.

We were thrilled beyond description by what we had seen; but of all we had been through, our passage into the heart of that plume or jet of ice particles was the most intriguing.

Before the start of this flight, we had seen the mountain on several occasions from the Moths, from 5,000 feet up, which had taken us above the ground-haze, usually only 5,000 feet from the ground level, but enough to entirely obscure the mountains from the plains.

From the Moths we had seen what previous explorers had called "the plume" of Everest and

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had somewhat readily taken it for granted that it was merely a cloud, of which the component particles would naturally be frozen, and similar to that one usually sees in the vicinity of high mountains.

Kangchenjunga for instance, was seldom without such a cloud wreath, throughout April.

When, however, the machines went actually into it, we realized that it was something quite different to what we had conceived. Here was no drifting cloud wisp, but a prodigious jet of rushing winds flinging a veritable barrage of ice fragments for several miles to leeward of the peak.

The force of the *rafale* was indeed so great as to crack the celastroid windows of the Houston-Westland's rear cockpit.

We soon realized too, that this "plume" could not be composed of frozen matter carried over by the blizzard from the windward face, for the reason that the windward faces were practically bare.

Perhaps some day science will find a solution for this riddle, the enigma of the great mountain.

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We ourselves are inclined to the opinion that this phenomenon is due to the immense overfall of the winds over the crest, giving rise to what aerodynamical experts call a "burble" on the leeward side, that is, a zone of reduced pressure, which tends to draw up the air from the Tibetan side and with it great masses of old snow and fragments of ice. Perhaps, too, drops of moisture are drawn up from lower levels, frozen in the process, and projected back down wind when they come into the grip of this vast maelstrom.

This is merely a tentative theory, and we can but hope that scientists will take up the mystery of this singular "plume."

We realized that our passage through it, and through the complimentary "downfall" on the windward side, hard by the South Peak ("Lhotse") had been the great adventure of our flight.

Still, it was not our business to have adventures, for adventures are eschewed by all well-organized expeditions.

## IX

### The Flight Over Kangchenjunga

*Undertaken as Final Rehearsal for Second Flight Over Everest—Fellowes' Account—Trouble with His Oxygen Mask—The Magnificence of This Virgin Mountain—In the Clutches of a Gale—Lost in the Clouds—Escape and a Forced Landing at Shampur—Mobbed by the Natives—Second Landing at Dinajpur—The Moths to the Rescue*

THE first flight over Everest on April 3rd had encountered difficulties in the matter of the vertical cameras and telephone gear, while certain inconveniences in the heating suits were manifest. The results obtained by the oblique cameras appeared to be very good, but those of the vertical had been spoilt by the dust-haze, and the observers were therefore not certain whether the right exposure for the conditions had been given for them. All this gear had been satisfactorily operated over Karachi at the same height—

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35,000 feet. But it was deemed advisable to try again at the maximum height, and over snow, to make sure that all was correct. As snow scarcely exists at this season south of Kangchenjunga, they decided to fly over its summit, the height being approximately 28,200 feet, and secure aerial photographs of what was unknown country. The meteorologists considered that the fine weather experienced on April 3rd, the day of the first flight over Everest, was unlikely to last much beyond the 4th, and so the attempt upon or, rather, over Kangchenjunga, was planned for that day. It meant hastening preparations, as the flight was scheduled to start from Purnea at 8 A.M. Even so, owing to the numerous adjustments necessitated before the flight, the take-off was delayed, owing to the vital necessity of having everything in order before leaving the ground.

There were two main objects to attain; perfection in the apparatus for the next attempt over Everest, and good cinema photographs of mountain scenery. The crews consisted of Fellowes and Fisher in the Houston Westland, and Ellison and Bonnett in the Westland Wallace.

The consequences of the delay were unfortunate;

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for when the aircraft rose through the haze, encountered at a height of 19,000 feet, Kangchenjunga appeared tantalizingly close on the port bow, perfectly clear and free from clouds; but by the time the mountain was reached, 1,500 feet of cloud completely enveloped the top. This piece of bad luck definitely prevented them from going vertically over the summit or obtaining a clear picture of the upper part of the mountain. From the photograph it will be seen that the summit only shows dimly through the clouds. When it was taken, the airplane was almost vertically over the summit.

The planes took off separately at ten o'clock, it being the first occasion on which either Fellowes or Ellison had flown this type of aircraft. They climbed slowly at first through the haze to gain familiarity with the controls, and by the time 12,000 feet was reached, both pilots felt thoroughly at home with their machines. At that height Fellowes pulled his oxygen mask up to his face; he had carefully adjusted this when on the ground, but found that the system of straps which had appeared so satisfactory on the aerodrome, now failed completely to hold the mask in posi-



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tion on his face, if he moved his head at all. This meant that every time he looked at the instruments, or over the side or tail, he had to readjust his mask, and eventually to hold it on with his hand. Ellison was experiencing the same difficulty. To quote Fellowes' own description of ensuing events:

Finding that I could hold my mask on with my left hand, without unduly interfering with control of the machine, I decided to go on mainly because the expedition's supply of fuel and oxygen had been finely cut, and it would have been difficult to justify another experimental flight over Kangchenjunga, supplied as we were with a limited quantity of gasoline and oxygen to make this attempt. So we proceeded, and at 19,000 feet obtained our first sight of the mountain over the haze, although still some distance from the hills which rise steeply from the plains on which our aerodrome was situated. They are only a few hundred feet above sea-level and extend for hundreds of miles north-west and south-east. These hills, which appear insignificant from the air, are most imposing when viewed from the

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ground, rising to a height of 5,000 or 6,000 feet within a few miles of the plain.

Our first sight of Kangchenjunga standing out in all its white majesty against a clear hard sky, was truly magnificent and enthralling, since it was quite free of clouds. We now set our course for the confluence of the great Rangit at Tassading, whence we proposed to take a straight photographic strip to include this confluence and the mountain-peak. I wondered if I would be able to recognize it, hampered as I was by goggles and oxygen mask. Disappointment was in store, as it soon became apparent that a mass of clouds lay between the foothills and Kangchenjunga, completely blotting out the area we had proposed to photograph. This did not affect the test, the important point being to secure vertical photographs of the snow regions, and to insure that the automatic vertical cameras, when set in motion by the pilot continued to work, allowing timing intervals to be changed, and the cameras to be stopped and started. The cameras were operated and tested in every possible way, responding satisfactorily, this being done by the pilot.

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### PLUMED GIANT

In this photograph the white plume of Everest is seen once more stretching nearly as far as the jagged peak of Makalu, twelve miles to the right. This picture is remarkable because it shows about a third of Mount Everest, or 10,000 feet of its height. The lower part of the mountain gradually disappears in the slow descent to the plains of India on the southern borders of Nepal.





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During the flight over clouds, the mountain was drawing nearer and nearer, and was now no more than some thirty miles away; but the summit was becoming blurred. It seemed as though the photographs of the top we had set our hearts on getting, might not after all be obtained. After examining the instruments, in turn, it was comforting to see they all registered the correct readings.

Then a look round revealed a wonderful scene. I was amazed. Behind lay the plains of India, cut in all directions by the broad and winding sand-courses of the many river beds flowing from the Himalayas and constantly forming new channels for themselves. Nearer still lay the green hills of Sikkim with their mane of trees and vegetation, their heights varying from 4,000 to 7,000 feet. Irregular in formation, being deeply cut up by deep valleys, gorges and river beds, it was strange at this moment to ponder how these hard and knobly-looking hills grew the plant that provides the homely cup of tea. . . . Directly beneath the aircraft was a sea of clouds, and looking forward as the mountain came nearer and

### MOUNTAIN PANORAMA

The vast billowing mountain range stretching to the north of Kangchenjunga looks like a titanic sea. In the foreground is a colossal mountain of rock and snow. Clouds are seen moving over the mountains and settling in one of the huge valleys near the middle of the picture.

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nearer, great peaks of over 20,000 feet upreared themselves from the clouds which lapped the upper slopes of Kangchenjunga and its main range. We were now looking down on scenes never before viewed by the eye of bird or man.

Kangchenjunga is not a mountain in the ordinary sense; it is a mass of mountains reaching out southwards from the main Himalayan range stretching in a north-westerly, south-westerly, and south-easterly direction, mighty beyond imagining, bounded on all sides by such awe-inspiring scenery as human eye can rarely gaze upon. To attempt to describe it by saying that in these directions lay a stretch of snow peaks, glaciers and tumbled valleys, giving the appearance of a terrific sea, imparts little idea of what lay beneath us. Still less can the camera convey the wonderful impression of the illimitable magnificence and immensity of the scene. Away to the northwest Everest and its companion towered up into the sky, and far beyond them, stretching in to the blue distance appeared an array of lesser mountains.

All this time the great mass of Kangchen-

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junga was drawing nearer, and now it became certain that the cloud formation at the top was rapidly growing denser and higher. Forty minutes after having seen the mountain-top completely clear of all cloud, there had formed a huge cloud cap 1,500 feet thick, and many miles in area, completely obliterating the summit. Looking away from this disappointing coverlet the cold mountains were putting over their heads, I saw Ellison quite close, with Bonnett busily operating his camera. Fisher, who had been quietly preparing for this moment, now asked if he could open his cockpit. I agreed, as we had by then attained the desired height of 34,000 feet. Again I looked over the side and saw Ellison coming up almost wing-tip to wing-tip. Incidentally, I had to be careful about moving my head because of my oxygen mask; and yet move I must to see my instruments, to look over the side, and to manipulate the camera. We were now approaching the great cloud over Kangchenjunga itself. Eventually we were so close to its edge that we could look down almost vertically over the top, and so we proceeded to fly round it; but, owing

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either to slightly inaccurate flying or to a down draught, we gradually lost height as we circled the mighty peak. Eventually, we must have dropped to approximately the same height, although it was difficult to be certain of this.

We were now very close to the mountain, and gaining the northeast or easterly side, ran into a prolonged and severe disturbance, as a result of which my accelerometer registered 2.8 g. It was so sudden that for a time I seemed to lose all control of the ailerons and rudder, and did not know what was going to happen. The machine rocked, twisted and shook in a way I had never experienced before in eighteen years' continuous flying. Once it seemed certain we must drop into a spin. However, after what seemed an eternity, but was probably not more than half a minute, we ran into still air with only a trifling loss of height, and renewed our efforts to go over the top. The accelerometer, it is true, only registered 2.8 g, but the sensations that *we* registered, had it been possible to do so as a measure of nervous disturbance, would have vastly exceeded any such scientific relativity. In such critical circumstances



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there is no time for fear. There is too much to do. At that great height even in quiet air some nervous tension was natural, and certainly for several minutes I experienced that blurred feeling one gets after a bad shaking.

Soon after this the two machines became separated, due to a turn which I made without realizing that Ellison had again come up close to me on the north side, and causing him suddenly to lose height. I had not sighted him for some few minutes and imagined he had gone back. After cruising another quarter of an hour in the vicinity of the mountain, I gave up all hope of being able to cross the summit, and turned back, flying first to the north, and then heading south for home. But I could not recall which of the various courses I had written down on my map was the correct one to avoid the Nepalese border. This lapse of memory I put down to want of oxygen caused by my ill-fitting mask. My brain was definitely too tired to enable me to reason out the correct course which, in normal conditions, I could easily have done. There are no signposts in the sky. The mountains now on my port quar-

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ter were of no avail in assisting me to determine the southerly course. The whole country was completely covered by clouds as far as the hills extended, and so I flew due south, being now able at last to think clearly enough to be certain that this would take me in the right direction and away from Nepal.

Once beyond the hilly country, I descended through the haze and looked round for any familiar objects, but Indian maps are on a small scale and it is difficult to recognize rivers or railways unless distinct in their formation. However, I seemed to recognize one place and made out a course on which I flew for nearly half an hour. Still unable definitely to identify the country below me, the idea came to me that I was too far west, whereas in reality I was much too far east. Having circled round for some time and still finding it impossible to locate any suitable landing-ground, I determined to alight in the first suitable area near the railway line, along which I was then flying.

I chose a fairly large field in an apparently uninhabited area, apart from a few huts. But I very

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soon realized my limitations as a censor, for a couple of minutes after landing I was surrounded by thousands of wildly gesticulating Meharis, those nearest the airplane endeavoring to touch or finger it; so much so, that like Gulliver on his travels, I was despairing of being able to get away again, especially as all the children and young people seemed seized by an irresistible desire to sit on the tailplane. Meanwhile, I kept the engine running slowly as I had no means of starting it. The starting-handle had been left at Lalbalu to reduce weight; in any case it could only be operated by two people who knew all about its use, a third man being required in the cockpit at the controls. Every few minutes I had to draw on that precious supply of gasoline by opening up my engine to drive the people away and frighten them off the wings. Fisher and I shouted to ascertain if anyone in the crowd could speak English. Eventually, a native came to the side of the cockpit who appeared to understand what we were saying, so Fisher produced the map. Although he could not speak English, he understood what was said to him, could write the language, and

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more wonderful still, read a map. Singularly intelligent, he pointed out without hesitation our position—at Shampur. So we pushed the people away like policemen at a cup final, and climbed in.

I had then to take off as best I could, ringed in on all sides by a brown, struggling mass of men, women and children, inextricably mixed up with dogs, cows and donkeys. I had already used the engine to frighten the people away from the airplane; now I fell back on the threat of the throttle. Rumbling the engine, I gradually turned the plane round in the direction for taking off. Fortunately the crowd, including the livestock, seemed to understand the danger and fell away to either side, with the exception of the children and sundry odd brown babies who continued to run across our path, as well as cows and innumerable dogs. Impatiently we waited until all but the dogs were clear of the track, then opening the throttle, made our get-away, hoping for the best.

All went well, and I was once more in the air, but only ten gallons of gasoline were left. With

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this Purnea could not be reached, but I could get nearer home, so followed the railway line until reaching Dinajpur with its large Maidan. Unfortunately, the plain is punctuated with trees, and a crowd of people filled what appeared to be the only possible landing-place. There was no gasoline left, so land I must somewhere. Selecting the best available area, due to providence rather than my own good piloting, I alighted safely, managing only by inches to clear a schoolhouse surrounded by railings and a couple of large trees. It being the first time I had flown this airplane, with two forced landings, the second an extraordinarily difficult one, I felt that the inscrutable influence some call luck, and others providence, was with me, notwithstanding that I had been unfortunate enough to lose myself. We were most hospitably received by the local magistrate and an Indian gentleman whose first form of welcome was to provide us with cooling drinks. Then the Superintendent of Police, and later the Collector, put in an appearance.

Our first action on landing was, of course, to get into touch by telegram with the headquarters

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at Purnea, which we had not been able to do at Shampur, there being no telegraphic or other facilities to be found there. The helpfulness and courtesy of all concerned was really delightful. I was very much impressed with the Indian magistrate and the Indian police officer and the way he handled his men. I gathered the latter was a bit of a hero, and that attempts had been made on his life in revenge for his efficiency.

In the evening, just before dusk, Clydesdale arrived in his own Moth, with various items necessary to picket and cover in the machine during the night. Characteristically, he had thought all this out and got it ready as soon as he knew I was missing. He had also flown my wife over from the main aerodrome at Lalbalu to the headquarters at Purnea, so as to be in touch with the telegraph office. Gasoline he was unable to bring, since his Moth could not have carried enough to refuel the larger machine.

The Collector kindly arranged to put us up for the night at the rest-house, and later on we were entertained by the members of the Methodist Mission on their lawn. Dining under a full moon

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on a calm and scented evening proved a restful and peaceful way of ending a rather hectic day.

Very early the next morning Ellison appeared in the Puss Moth with Pitt as passenger and twenty gallons of gasoline. How welcome they were! The speed and efficiency with which Pitt refuelled the Westland and started it up, was typical of his work for us. I then took off before an enormous crowd, with whom early rising, normally regarded as a virtue, appeared to me on this occasion to be a vice, and returned to Purnea, leaving the two Moths to follow on and their occupants to be entertained at breakfast by our hosts of the night before.

As a result of this flight it was possible to put all the apparatus into thoroughly good order for the second attempt on Everest, thus fulfilling the main object we had set out to accomplish. We also obtained some excellent cinema photographs.

It is never any good crying over spilt milk; but, had we been so disposed, we should undoubtedly have been very mournful over our bad luck in finding such desperately bad weather conditions over and near Kangchenjunga. These

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completely ruined our chance of getting any photographs of value from a geographical point of view. It was a remarkable thing on looking back to realize how quickly the clouds covered Kangchenjunga after we had first sighted it. Then it was as clear from clouds as was possible for a mountain to be. Again, it was astonishing how quickly the weather in the whole area altered; we must have arrived at the very moment when it was on the change. Bad luck with the various little things delayed us at the start. Otherwise the trip, instead of being only partially successful from the photographic point of view, would have successfully compared with either of the Everest flights.



## The Second Assault of Mount Everest

*The High Cost of the Dust-Haze—The Bastions of Everest Must Be Surveyed Again—Undeterred by a Cable from Lady Houston—Suspicious Warnings—The Fate of General Nobile Recalled—Second Flight Essayed on the Anniversary of the Battle of Lexington—Eye to Eye with the Giant Again—The Cameras Perform their Duty—Blacker's Screw-Driver Spins Down to Nepal—The "Houston" and the "Wallace" Return to Purnea Victorious—A Great Task Accomplished*

IT HAD been brought home to the airmen that much of their labor on the first flight had been fruitless. The main object of the expedition was still unattained. There were no recriminations, however. The personality of their leader had welded the whole party into a band of brothers, into a structure based upon deep-seated confidence in him and one another.

In any case recrimination would have been futile.

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None could have foreseen that the dust-haze would persist to the amazing height of 19,000 feet. There are as yet no scientific processes for measuring the upper limits of such a haze; no means other than investigation by balloon or airplane. Furthermore, to take off for Everest at the early morning hour essential to finding the peak itself comparatively free from clouds precluded such scouting. And there were no previous observations to serve as guide. It was this unprecedented dust-haze which, more than anything else, prevented the fliers from obtaining useful vertical photographs on the initial flight of April 3rd. The curtain of fine dust rendered invisible not only the southern ground control but the details of the country up to the mountain itself.

Even in the earliest phase of their plans, the fliers had realized the possibility that a second flight would be necessary. There was such a mass of sensitive and delicate devices and gadgets, any one of which might well go wrong in those exceptional variations of heat and cold, and invariably required to work without any lubrication; for the oil would freeze.

But a more probable source of trouble lay in the presence of clouds in the higher country. A mass of

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cumulus lurking in one of the big valleys close up to the mountain would probably have been invisible from the air until too late, when the machines had already been committed to crossing the Nepal frontier. Such a belt of cloud would have broken the continuity of the strip of vertical photographs, and thus rendered it valueless for plotting onto the map or, in fact, for any scientific purpose.

Even had the verticals of the first flight been entirely satisfactory, it was recognized long before the expedition left England that they owed it to science to obtain an adequate result from those splendid airplanes, and enough to show their appreciation of Lady Houston's generosity.

It would, in any case, have been incumbent, from a sheer sense of duty, to have made a second flight to increase the area photographed on the first. There was such an immense extent of unknown country that a dozen flights would hardly have been adequate to map it.

In any case, they could not have refrained from making a second flight for the cogent reason that the Government of Nepal, which had treated them with so much consideration and courtesy, had imposed the

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condition that permission for the flights was given solely for scientific purposes. Scientific purposes could mean nothing less than the making of a continuous strip of vertical photographs, which they had not yet succeeded in doing.

They felt that it would have been failing in their duty had they accepted the facilities so cordially granted by the Nepal Government, and the hospitality and assistance accorded by all branches of the Government of India, and not justified this confidence.

Perhaps the greatest factor actuating the men was the realization that, had they abandoned their objective without attaining it, they would have brought discredit, not only upon themselves, but indirectly upon Lady Houston as a champion of British aviation.

They felt it more especially a duty to her because they had called the expedition by her name, and were loath to bring discredit upon it.

Not unexpectedly, a cablegram was soon received from Lady Houston herself, addressed to Clydesdale, advising him, in sympathetic words, not to run the risk of further flights over the mountains. This mes-

### THE MONARCH ON HIS THRONE OF CLOUDS

The view of Everest, seen across a great ocean of billowing white clouds, is one of the most magnificent spectacles in the world. The great Himalayan range of which Everest forms a part is one of nature's greatest irrigation reservoirs. From the masses of ice and snow stored in these mountains come the streams which provide the water and carry the silt which give life to millions of people in the northern plains of India.



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regard for his personal safety that General Nobile acted as he did in the Arctic, and for which he was broken.

The cynic would remark that before he was broken by his own government he had already been judged and condemned, without a hearing, by ignorant outsiders, by the howls of an uninformed public opinion.

So they remembered Nobile and fully realized that, were they to abandon their efforts to make the expedition a success, the cause of British aviation must inevitably suffer.

Of our troubles, the principal was that due to the weather which behaved in a manner infuriating and worrying to the last degree. As already remarked, there seemed to be a ten- or twelve-day cycle in its vagaries at this time of the year. At its commencement they would receive a telegram from Calcutta, announcing a disturbance on the northwest frontier. These reports from the Indian Meteorological Bureau were almost uncanny in their accuracy. It was soon appreciated that the disturbances to which they referred were neither political nor brigandly, but meteorological, and that they traveled westwards, taking four or five days to cross India and reach Purnea.

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The disturbances brought with them downpours of rain and duststorms, accompanied by high winds at the upper levels.

Then the lofty mountains, which had been smothered in thick clouds would gradually clear, and at the same time each day's report of the wind velocities, taken from the balloons, would show a lessened force.

The party was between two dangers. If, on the one hand, the fliers played for safety and waited for the wind to abate to its lowest, as recorded in the afternoon, there was every possibility that by next morning it would have increased again. If, on the other hand, they were to risk going to Everest in a high wind, they courted trouble from running short of fuel and so being unable to complete the return journey. To fly from one point to another and back in a high wind, is equivalent to flying by a curved, that is, an indirect or longer route.

The ingenuity and resourcefulness of their scientifically-minded second pilot, McIntyre, came to the rescue.

It was known that the winds at low altitudes usually blew from the east and were seldom very strong.

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Conversely, the upper winds were from the west and correspondingly powerful.

McIntyre worked out a plan by which the two Westlands would fly in company for approximately one hundred miles to the westward, or slightly north of west, at a height of about 3,000 feet. This would bring them to a point roughly over the frontier of Nepal well to the westward of Mount Everest in under an hour, since the easterly wind would be favorable.

They would then climb to 18,000 feet to attain adequate height over the minor mountains, at the same time turning towards Mount Everest, or northeast. As they climbed and flew in this direction, the powerful winds at that height would be behind them, at any rate sufficiently in the rear to give appreciable aid.

This stratagem promised to go far towards solving one of their main difficulties, and all applauded the skill and ingenuity of its originator.

Apart from the weather and the question of personal risk, there was no obstacle to a second flight.

So, after waiting for a spell of cloudy weather to clear away, the two planes took off from Lalbalu early on the morning of April 19th.



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At dawn they had hurried to the observatory roof to see the wind reports. They were disquieting. The wind strength at 24,000 feet, taken from the theodolite readings, was eighty-eight miles an hour, and at greater heights even stronger than that formidable figure.

The early reconnaissance by the light scouting Moth gave a report that was both tantalizing and disquieting.

All had been clear as regards clouds just after day-break, so went the report, but they were showing ominous signs of coming up from the west, at least into the lower valley of Nepal.

Now Blacker, once more the observer in the "Houston" tells his story:

I was determined that nothing should prevent my making the camera work, so crouched over it, and as soon as the pilot switched on for exposure and I saw the flexible drive give its preliminary writhe, I seized the knob of the hand-working gear and turned it gently to help the electric drive over. All was well, and this process was repeated every twenty seconds. For some-

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thing like an hour I must have been huddled over the vertical camera feeling its pulse, as it were, and coaxing it along. Everest lay straight before us and great cliff-bound valleys streaked with snowfields were clear beneath us. The all-important camera was working.

Suddenly a message came from the front of the cockpit. The electric plug was vibrating out of the pilot's oxygen heater and refused to stay in place. It was a critical matter for the pilot to have to hold this in one hand and yet fly the exceptionally steady, level course demanded by the air survey with the other. Fortunately our telephones were working and so we could consult. Previous misfortunes with the gear had led me to take up a screw-driver, which I passed forward with the suggestion that Clydesdale should prize open the split-pins of the plug with it. This he did and his troubles in that respect were over. Next I had a fresh struggle because the drift clamping screw of the survey camera had stuck fast from the cold, and the screw-driver was used in an effort to release it. This was not entirely successful because I was afraid of wrecking the whole camera.

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On we went up to 31,000 feet, the mountain getting ever closer; and now I started busily taking oblique photographs of those unexplored declivities, ridges, and ranges which run southwest from Everest. This was indeed to be the main prize of our flight, because it is precisely these aspects of the massif that are unknown to science. All went well. I alternated between diving down to the survey camera to help it to do its appointed task, and leaning over the side of the open cockpit to take obliques and train the cinema camera on magnificent spectacles. I had besides the still camera a Kodak baby ciné-camera, and a hectic time dividing my attention between them in the twenty seconds' interval between the exposures of the survey camera.

Our previous experience had shown where we might expect the great horizontal eddy on the windward side of the South Peak, and our common sense led us to avoid entering it as only harm would ensue from the tilt which must necessarily be imparted to the vertical photographs.

Meanwhile my own busy task kept me hard at work indeed, panting for breath and racking my

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lungs to fill them with oxygen. Every few seconds I was forced to get down to the cockpit floor to supervise the fixed camera. Then I had to spring up, reload the trusty Williamson P.14, uncap the slide, set the shutter, select an object, steady the camera solicitously against engine vibration, and release the lever. Then quickly the slide had to be covered again, and placed carefully in the cunningly devised slide box, with its spring lid. We had been forced to make these because of the intense powers of penetration which light seems to possess at these altitudes. In our early trial flights I had found it creeping in around the edges of dark slides and fogging the margins of the plates in the most exasperating manner.

The pilot handled the machine with that hardihood and surpassing accuracy which filled me now, as ever, with complete confidence.

Soon we flew once again over the cliffs of the South Peak, scarred with its huge triangular crags. We came close once more to Everest, which had lost none of its entrancing beauty.

The machine circled serenely, unmindful of

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the hurricane blast to which the six-mile long "plume" from Everest summit bore witness. I photographed incessantly, striving always to remember the gaps of the first flight and to make them good for science.

Now we were over the spurs of Everest, and now over the peak of Makalu and the yet untrod-den tangled ranges to the southeast.

Meanwhile the mountain came ever closer, bare and clear in the wonderful atmosphere and free from cloud, except for its great plume, now bigger than ever. In the crystal-clear weather I was delighted at the view over great Khumbu glacier and the terrific ridges which bound it. Again to the west, for an immense distance, stretched a chain of countless peaks, while in front to the east the great range continued broken slightly by the Arun Gorge, then sweeping round to the huge mass of Kangchenjunga, Kabru, and Similochun. On we swept, veering a little more to the northeast to skirt the southern declivities and shape a course practically on Makalu.

Having come to the apex of our course, practically over Makalu, Clydesdale now steered south

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for the homeward journey, giving me wonderful views as we flew parallel to and on the west side of the great Arun Gorge. On our right now was the lofty snowy Chamlang range, behind us great snowfields, while below was the unbroken tumble of side valleys that run down to the Arun. The air beneath was still and clear and the survey camera, helped every now and then, continued its scientific work. Presently my screw-driver again came into use in reloading my cinema camera with a new film. When the job was done I was congratulating myself, though slightly breathless from winding the clockwork, when the priceless screw-driver fell from my hand, and in a moment I saw it flashing through the open floor hatch with a glint of sun on its shaft as it sped on its way to Nepal.

All my plates had been used, however, and we were steadily losing height, though we had not been able to regain touch with the other machine. Most of our work had been carried out at an aneroid height of 31,000 feet.

Soon enough our time was finished. We could not linger, so regretfully had to turn southward

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once more. Our rudder was silhouetted against the snowy pyramid of Makalu, the great gorges of the Arun opened out to the east, and the somber pine forests of that valley appeared with the swift-flowing river, occasionally passing grey sandbanks. We crossed transversely the Mahabharat range, almost indistinguishable in comparison with the mountains we had come from. Soon we were back over the familiar checkerboard of Bihar, and descended gratefully to our landing-field.

Now came the greatest anxiety of all. We had risked everything to make the survey photographs a success, and any one of a hundred mischances might have nullified our efforts. No cameras had ever before been asked to operate in such extremes of heat and of cold, running unlubricated, and never free from the impalpable all-pervading dust of the plains.

I tore off my mask while still in the air, then gloves and helmet, and unfastened the innumerable wires of my electric harness before the wheels touched the familiar green turf of Lalbalu. An

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anxious hour followed as the skilled fingers of Aircraftman Fraser worked in complete darkness.

The excitement and anxiety were intense, while we waited later on outside the dark-room to learn the results. Fortunately for me the suspense was mitigated by having to go up on another flight during the afternoon to take infra-red photographs, necessitating a climb to 21,000 feet without oxygen. On landing I was overjoyed to find the spools had come out, the quality of the photographs admirable, and that both airplanes had secured an absolutely unbroken survey strip. These must assuredly be unique, because never before have such tremendous glacial mountains been photographed from above.

Hasty examination showed the overlaps to be complete, and all exposures astonishingly free from distortion. This is partly attributable to the skill and good flying of the pilots, also to the remarkable calmness and freedom from bumps, even when the wind velocity was, as it proved to be at times, of the order of 120 miles. In fact, in the second leg of our course, it was necessary to



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change direction somewhat in order to make any headway at all. Everything worked excellently, except that the trouble I had on the first flight with the accumulator cut-out repeated itself, but this time there was a screw-driver instead of my thumb-nail for dealing with it. Although without oxygen till 18,000 feet, neither of us felt any ill-effects. The consumption of oxygen during the flight was surprisingly small. It is a testimonial to the care with which the oxygen was prepared in England that there was no vestige of trouble due to moisture in the valves.

On both flights we had been fortunate with our oblique photographs. The first venture of April 3rd produced thirty-five, the majority from the excellent P.14 on the 5 inch by 4 inch size, and the balance from the pistol camera. On the second flight we secured as many as fifty, practically all of good quality. It was, however, the verticals on the second flight which disclosed to our anxious gaze the mysterious heart-shaped black patch, high up on the frozen white flanks of the great range, which is doubtless a hot lake, and one no man had ever gazed upon before.

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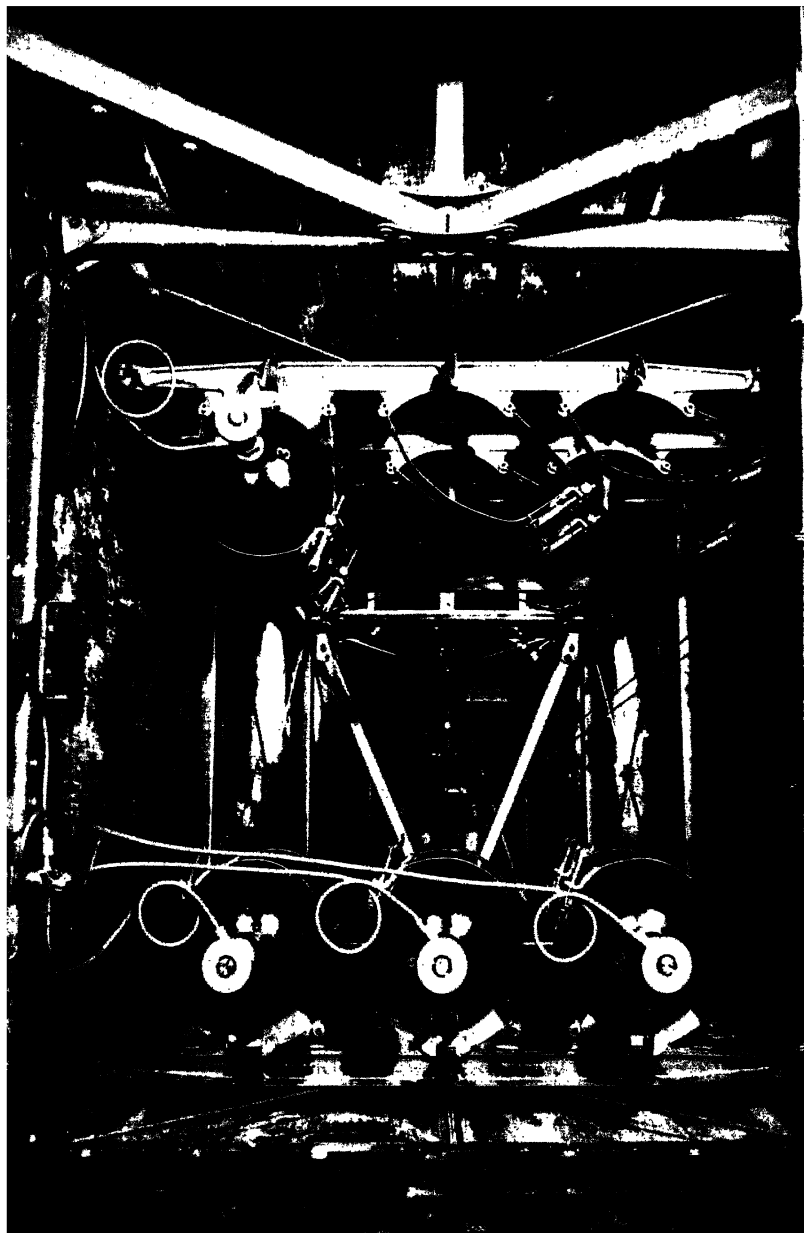
We feel that we have accomplished our task—  
to demonstrate that inaccessible country may be  
photographed from the air even at extreme  
heights.

*APPENDIX*

### SECOND ONLY TO EVEREST

In this remarkable photograph the cliffs of Kangchenjunga are seen just below the summit. This view, taken within 200 or 300 feet, was the closest photograph made of any of the mountains. Kangchenjunga rises to a height of 28,225 feet and is 80 miles southeast of Everest. On top of the wall of rock and just below the summit is a vast snow field.





# Appendix I

## Oxygen, Special Masks and Clothing

*By a Member of the Expedition*

**O**XYGEN supply for the crews of the aircraft was taken in hand in the earliest stages of the technical organization of the expedition.

It was clear that no flight over the mountains could possibly be carried out unless both pilot and observer were provided with an adequate and reliable supply of oxygen.

This may seem strange when it is considered that the climbing expeditions or, the assaulting portions of them, have been to over 28,000 feet, independently of oxygen, at the same time putting forth physical exertions far in excess of anything the observer of an aeroplane, let alone the pilot, would be called upon to make. This, when exposed to the bitter low temperature, without the protection of an airplane or of electrical warming. The explanation is that the climber's lungs are gradually accustomed by several weeks of progressive ascent to a higher altitude, whereas the pilot and observer of the airplane must go from sea-level to over 30,000 feet in less than three-quarters of an hour!

It was certain that no human lungs could stand such a strain, and furthermore, if the oxygen were for some reason to fail suddenly at any height over 25,000 feet, disaster would almost certainly ensue, for the pilot would lose consciousness and the airplane get out of control. It was not possible even to fit a dual

### BOTTLED AIR FOR THE FLIGHT

The oxygen bottles which are indispensable in high-altitude flying were stored in the rear of the observer's cockpit. Three thousand liters of oxygen, equivalent to 3000 beer bottles, were carried in each plane. One of the major difficulties which the expedition had to overcome was that of carrying enough oxygen to supply the flyers during the trip.

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control for the observer. Should such a failure take place during an ordinary high flight, or an attempt on the height record, carried out over low-lying country, the pilot would have a chance to tear off his mask and regain consciousness after the machine had, by itself, dived or spun down to lower levels. Several high-flying pilots have been saved in this way, although just prior to our flight a French experimenter had been killed after spinning down to over 30,000 feet, apparently without regaining consciousness.

In any case, over high mountains it is evident the machine would hit the cliffs or the crags and be destroyed long before the pilot could regain consciousness and control.

So much for the vital importance of the oxygen. It remained to give effect to means which would deal adequately with the situation.

Fortunately, one of the first of the facilities generously placed at the disposal of the expedition by the Air Ministry, included access to the stored-up experience and resources of the Royal Aircraft Establishment.

It may be of interest to see how neat oxygen is obtained for the use of aviators. It is produced from air by liquefaction and rectification. The low temperatures necessary for this are obtained, in the first case, by compressing the air, then cooling and expanding it in an engine running under load. In this way work is done in overcoming the resistance afforded to increasing volume, with the result that heat is abstracted from the air and its temperature further lowered.

This cooling effect is made cumulative by the use of "heat interchangers," tubular metal devices in which the cold gases, after expansion and subsequent treatment, are made to travel in



## FIRST OVER EVEREST!

indirect contact with, and in counter-current to, the incoming cooled compressed air.

Some of the air is liquefied as such, whilst the remainder yields two separate liquids, one containing almost the whole of the oxygen, the other consisting practically of pure nitrogen.

These liquids are introduced into rectification columns in which they travel downwards through numerous plates constructed to insure intimate contact with the ascending gas, the latter being produced to the base of the column by evaporating liquid as it arrives there.

As a consequence of this counter-current between the liquid and the gas, a very pure liquid oxygen is obtained. When this is again converted into gas by evaporation, its purity is of 95.5 per cent. or even higher.

In such apparatus the resultant temperatures are extremely low, down to  $-190^{\circ}$  C., so that all cold metal parts have to be well insulated to prevent, as far as possible, ingress of atmospheric heat.

Before being liquefied, the air must be thoroughly free from carbon-dioxide, since this gas, always present in the air to the extent of at least .03 volumes per hundred, becomes, at the low temperatures involved, a solid, which would rapidly choke the plant.

For a similar reason, the slightest amount of moisture present in the air would be a source of trouble, and this has to be carefully removed in the "heat interchangers."

As the warm wet air cools, the water is thrown down as a liquid until the temperature reaches  $0^{\circ}$  C. and it is then deposited as ice on the metal walls of the interchanger tubes. After traversing the length of the interchanger and being subject to still lower temperatures in the rectification columns, the oxygen

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which is separated from the air leaves the plant in a perfectly dry condition.

In the subsequent process of compressing this dry gas for filling cylinders, contamination with water occurs.

The compressor cylinders must be lubricated with water, for to use oil would entail combustion, or a violent explosion.

Fortunately, almost all the water is again removed from the oxygen by the act of compression, since a gas saturated with water vapour at atmospheric pressure contains only one one-twentieth of this amount when it is compressed to 120 atmospheres at the same temperature.

For flying purposes the absolute and complete elimination of moisture is essential for reasons which we shall see later on. Hence a chemical means of effecting this has to be employed.

At the working pressure of about 120 atmospheres, the oxygen is passed slowly over solid calcium-chloride which is able to reduce the water content to the very low figure of .002 grams per cubic metre, that is, 2.5 volumes of water vapor per million volumes of oxygen.

Similarly, scrupulous care has to be exercised in the proper drying of the gas cylinders themselves before being filled. They are therefore subjected to a process of evacuation, the metal walls at the same time being heated.

So much for the preparation of oxygen. It will be seen how it was employed in the airplane.

The advice of the scientists was definite and unswerving. Oxygen should be inhaled from the ground up in a tiny but progressively increasing trickle until a maximum flow was reached at 35,000 feet. The reason for this is that the human lungs need to become accustomed to the breathing of pure oxygen.

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The ordinary atmosphere at sea-level contains only 22 parts in a 100 of oxygen; the remainder, comprising other gases, which, however useful they may be, in the formation of picturesque sunsets and other purposes, are of no use for breathing.

The pressure of the atmosphere at sea-level is 14.7 lbs. per square inch and as is generally known pressure decreases the higher aircraft rises. Consequently the pressure of oxygen in the air decreases as the pressure of the air itself diminishes.

This decrease in atmospheric pressure calls for the additional supply of oxygen, because of the deeper breathing necessitated to take a sufficient quantity of oxygen to replace that absorbed by bodily effort.

Two other dangers are the dulling of perception and judgment and diminishing muscular strength.

The flying personnel must therefore be supplied with sufficient additional oxygen to maintain normal breathing as at sea-level.

Thus, the aviator, given an adequate supply of oxygen, need not go short of breath at all until he reaches 33,000 feet, because the shortage of oxygen in the air can be made good by giving him compressed oxygen from a steel cylinder. At the height stated there is only about a third as much air to breathe as at sea-level.

Even with ample oxygen at heights of over 33,000 feet, the aviator is slightly breathless, especially if he has work to perform, this breathlessness becoming pronounced when the 35,000 or 40,000 feet mark is passed.

Another physiological difficulty threatening the high-altitude aviator, is the air pressure which supports the small blood vessels of the body becomes so much diminished that these tend to burst. This is a real danger in the case of those past middle age, or in the case of extreme heights at any age, tending to cause

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unconsciousness or acute and violent pains similar to those experienced by divers, who come up to the surface too rapidly.

To meet this contingency, all the flying personnel were tested in the great steel chamber of the Royal Aircraft Establishment.

This was the final stage. To return to the early preparations of 1932, there at once loomed the question of steel cylinders in which to carry the gas.

Few, if any, flights previously made, had necessitated keeping the aviators through as long a period as two hours, as this would at approximately 32,000 feet. Consequently, a large amount of oxygen was necessary, especially as the rate called for at the upper end of the climb was slightly over ten litres per man per minute. The weight of the cylinders to carry all this gas was an important factor in the loading of the airplane, and one which definitely affected its "ceiling" or maximum attainable height. Fortunately at this stage, Messrs. Vickers Armstrong had produced cylinders of a new type made of an alloy steel known as Vibrac, without which the flight might have been impracticable. The old type of carbon steel cylinder, weighed twice as much as the Vibrac cylinder, and was considerably less safe to handle, especially under conditions of exposure to strong sunlight. Not only are the Vibrac cylinders half the weight, but they possess the additional advantage of not being liable to burst, or fly into fragments if damaged. In fact, a rifle bullet can be fired through them with no more detriment than the rapid escape of the gas contained within.

Besides this method of carrying the gas under high pressure in steel cylinders, at least two other possibilities were considered.

One of these is the use of a portable oxygen generating plant. The development of this apparatus appears to have reached its highest form in Germany, but the resources at our disposal did

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not warrant the employment of these means. This method does not appear to have reached a sufficiently high standard of development to render it practicable for high-altitude use.

Another suggestion explored was that of intra-venous or intramuscular injections of oxygen. Here again there were practical difficulties, although at some future date these means may be of value, especially because a less amount of oxygen is required. For practical purposes, therefore, the carriage of oxygen gas in high-pressure cylinders won the day.

We next decided the number of cylinders, a problem in which the Royal Aircraft Establishment came to our aid.

Should the machine fly comparatively low, and then ascend at the last possible moment to the extreme height required to surmount Everest, the amount of oxygen called for would be comparatively small, as the high rate of consumption is only demanded when the machine is at its greatest altitude. Other factors, however, prevented this course being adopted. Consideration had to be given to the survey photography, which was the main object of the flight.

If the country from about forty miles south of Everest to the summit were to be photographically mapped from a comparatively low altitude, where the ground itself was low, then much film would be required to take all the necessary strips. The film itself was heavy, each spool weighing about  $4\frac{1}{2}$  lbs., and there was, in addition, the difficulty of changing the film magazines with certainty under the difficult conditions in the air. If we were to fly as low as possible, we would save on the oxygen and its weight; if, on the other hand, we flew high, we should save on the photographic gear but consume much more oxygen and take a slightly greater risk of oxygen failure. Both these variables had to be worked in to the performance of the engine and its

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supercharger, of which the "rated altitude" was 13,000 feet; at this altitude this particular variety of Pegasus engine, with its 7½-inch supercharger, does its finest work in terms of fuel consumption, speed, and climb, which in turn are dependent on propeller thrust.

Much calculation and the drawing of many graphs was consequently necessary before a compromise could be arrived at, giving the greatest efficiency.

There was also a political factor involved—the necessity for crossing the Nepalese frontier at such a height that the primitive inhabitants of the outlying districts, who had never before seen an airplane, or probably not even heard of one, might not be unduly alarmed.

Finally, we found it possible to carry four cylinders in each airplane, each of 750 litres capacity, a total of 3,000; or 1,500 per person. The fourth cylinder was to be a reserve for emergency only, and used only in case of failure of the normal supply from the remaining three cylinders. To make this safeguard a reality it was decided to duplicate all the piping and instruments of the oxygen.

The oxygen cylinders were carried in racks in the fuselages of the machine, and led through valves and high-pressure copper piping to a special oxygen instrument board in the pilot's and observer's cockpits, respectively. First it passed through a pressure gauge, which indicated the pressure and atmospheres in the cylinder, and, incidentally, in the high-pressure side of the system, this conveniently giving a direct indication of the quantity of gas remaining in the cylinders.

The initial pressure was 120 atmospheres, and the cylinders would be virtually empty when the pressure dropped below thirty. From the pressure gauge the gas passed to the regulating

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valve, which also comprised a safety valve, its function being to reduce the pressure from the high figure of 120 atmospheres to that at which the aviator wished to breathe it. The next stage takes it through the electrical heater, a cylindrical arrangement heated by a coil of electric wire, connected to a plug and socket. In succession it comes to the flow-meter, an instrument designed to show rate of flow of the current of low-pressure gas along its piping. Contrary to expectation, this little dial is not graduated in litres per minute, but in tens of thousands of feet of altitude. The wider the handle of the regulating-valve is turned, the more gas passes through the flow-meter, and the greater height is registered by its needle. The aviator therefore needs only to adjust the regulating valve until the reading of the flow-meter corresponds to the reading of the altimeter of the airplane. He anticipates the reading of the altimeter and gives himself sufficient oxygen for 5,000 feet as soon as he leaves the ground, increases this to the 10,000 feet rate when he reaches 5,000 and so on successively.

From the flow-meter the gas is ready to breathe and passes to a bayonet joint mounted on the instrument board. Into this is plugged a detachable tee socket which can be easily pushed in or pulled out by the pilot or observer, as the case may be, and secured only by a quarter turn. To this is connected a flexible tubing carrying the gas to the actual mask from which he breathes it. Several varieties of tubing have been tried, one of plain rubber, but with certain disadvantages of its own; another of petroflex, excellent except for being stiff and heavy, and in the case of the observer, at least, tends for this reason to push the mask off his face. In the actual flight, we used flexible metallic tubing, four and a half feet long in the case of the pilot, and nine feet in that of the observer. This answered well, except with

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one of the observers, who broke his pipe by treading on it, a test it was scarcely designed to withstand. Possibly, the ideal arrangement would be that the first half of the observer's pipe, should be of flexible metallic tube.

The object of the bayonet joint is to enable the aviator to detach himself rapidly from the airplane should he be under the necessity of executing a "brolly-hop" or parachute jump, as a preliminary to joining the Caterpillar Club.

We see how the gas has arrived at the mask, and the mask itself constituted one of the great afflictions which had to be borne by the fliers.

It was, in the nature of things, extremely difficult to attach satisfactorily to the human face, which has not been designed for such appendages.

Many were the adjustments of straps, and their refixing, which bound the mask to the unfortunate aviator's helmet. Final solution of the problem called for a quadruplex arrangement of metallic springs covered with leather, sewn on to the back of the helmet immediately over the crown of the head. A fiber mask of the pattern which was standard when the expedition started is distinctly uncomfortable, and projected very far to the front. It caught up in everything, more especially in the cameras which the observer had to handle, and made it almost impossible for him to look through the ordinary viewfinder. However, Messrs. Siebe Gorman have been at work on the problem, and the type they have now produced is a marked improvement and far more convenient.

An india-rubber experimental pattern produced by them, presented many advantages and was tried with success by us in some of the later high flights.

The mask fits over the lower part of the face, covers both nose,



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mouth and chin, but is not expected to be completely gas-tight. It has two air holes, for the individual does not breathe pure oxygen on his way up to 30,000 feet, but oxygen mixed with a decreasing quantity of air, drawn by suction from the atmosphere coming in through these holes. These holes also let out the expired air. The arrangement is somewhat unscientific, since some of the oxygen in the act of breathing is blown out and wasted. Moreover, we found it necessary to plug these holes with hastily extemporised corks when the 30,000 feet mark was passed, to ensure the observer getting his fair ration of oxygen undiluted by what in those levels passes for an atmosphere.

A minor complication in the oxygen mask was that it had to be fitted to overlap the flap of the electrically-heated goggles. Consequently there was a layer of the fur trimming belonging to these goggles interposed between the edge of the oxygen mask and the nose and cheek-bones of the user. This was to prevent oxygen coming inside the goggles and clouding them with mist.

The entire arrangement was distinctly cumbersome, and a sad hindrance to both pilot and observer. The pilots found the masks much in the way because it obscured their view downwards, and the observers were still more hampered from its preventing them getting the eye close up to the finders of the camera, or other instrument which they might be using. Finally, to surmount this trouble the oblique cameras had to be provided with special extemporised sights on the side. Fortunately, much has recently been done to improve the situation.

In the front end of each mask was mounted the microphone for the intercommunication set, by which observer and pilot could converse. The presence of this was a troublesome necessity as it lengthened the already excessive projection of the mask to the front. Yet again the switch of the microphone had to be in

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such a position that it was liable to knock against the camera, and so switch itself on, to the intense indignation of the pilot, whose ears were immediately filled with buzzings and cracklings.

Thanks to the skill and experience, both of the Royal Aircraft Establishment and Siebe Gorman, the arrangement worked satisfactorily and efficiently, but oxygen gear should be redesigned before high-altitude flights of long duration, involving real mental and physical work on the part of the personnel, can be regarded as an everyday proposition. Experimental work is already being carried out to this end.

We foresee air survey being carried out at upwards of 30,000 feet, with thirty-six square miles mapped at each exposure of the camera, and ten times that amount with multi-lens cameras. This calls for an everyday routine use of oxygen.

Long-distance air liners will, in the near future traverse the stratosphere at 35,000 feet; in fact, as high as the walls of passengers' arteries can stand. The airplane itself, whether with fixed wings or of the autogiro type, is superior at a greater height, and moves more easily through the air, with less "drag" or parasitic resistance. The engines of to-day can be so supercharged that there will be comparatively little loss of power in the rarefied air six miles up. One factor is still lacking; the propeller with variable or controllable pitch. With its advent airplanes having a moderate landing speed will fly not slower but faster as they ascend to great heights, so that machines which can take off at forty or fifty miles, will be able to fly at 300 or 400 miles an hour by the long-distance intercontinental air lines.

We see how this power of choosing his own height level will frequently enable the captain to find a favourable wind, where the low-flying pilot of to-day is often delayed and held up.

Before, however, that eventuates, designers must turn their at-

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tention to hermetically-sealed passenger cabins, provided with oxygen, and chemical means of absorbing the exhalations from the lungs, together with means of maintaining a positive pressure inside these closed cabins. We are only on the edge of a new world in aviation of which no man can gauge the limits.

It is apparent that the lives of the aviators depended upon their oxygen supply. Further, the oxygen must be warmed on its way to the lungs of the pilots and observers.

The need for this arose from the possibility that if a minute quantity of moisture were present in the oxygen, it would freeze in its passage through the tiny orifice in the regulating valve.

To guard against such an eventuality the oxygen passed through an electrical heater on its way to the flyers' masks, this precaution being additional to the extreme care the makers observed in its preparation. But however careful they might be, and the skill and foresight of the British Oxygen Company seemed almost superhuman, there remained the risk of moisture becoming condensed somewhere in the installation, whether picked up from flight through humid atmosphere or a water-laden cloud. In nearly all the high flights the aviators found their masks caked and clogged with ice, proof that there was moisture in their environment.

The oxygen was therefore heated in order that any chance drop might be blown through before being given an opportunity to freeze.

The current for this was drawn from the main electrical installation of the airplanes. We fully realised the importance of this system and the fact that everything depended on preventing the regulating-valve from freezing up, an event entailing almost immediate fatal results.

One could not help contrasting the margins of safety in every

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other direction—the airframes with all possible stress calculated and allowed for by experts; the engines with each minute portion tested by scientists again and again, duplicated magnetos and carburetors—all hanging upon our heel of Achilles, the tiny orifice in the oxygen regulating-valve, the keystone, and yet capable of being blocked up by a minute particle of ice or by a single able-bodied mosquito.

Every possible precaution was worked out, not only in the equipment itself, but in the routine and drill under which it was handled, tested, and checked.

The hearts of the big electrical installations safeguarding the oxygen were the thousand-watt dynamos, made for us by Messrs. Haslam & Newton, which performed their task to perfection.

As related elsewhere, not only were these dynamos larger than any hitherto installed in aircraft of our type, but they had to be specially driven from the engine. We devoted deep thought to the problem of finding a place for these dynamos in the highly congested interior of a fuselage in whose original design they did not figure. Finally, they were placed on their heads, as it were, immediately behind the engines in front of the pilots, and with their spindles vertical.

This position for the dynamo involved not only the manufacture of a special bevel gear, but its *ab initio* design, which the Bristol Company carried out in record time. Even were the latter unlimited, it would have been a difficult task.

The dynamos supplied current not only for the all-important oxygen heating, but for a multitude of other purposes.

Each aviator wore an elaborate one-piece suit with the lightning fastener running up the front. These admirable suits were made by Messrs. Siebe Gorman, and consisted of an outer shell of a hard wind-resisting "Everest" cloth. Beneath this was an inner

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suit of Kapok, quilted to a considerable thickness, and lined with twill. In this lining were sewn a galaxy of electric wires, the heating being conveyed through them all over the aviator's body, with the exception of his posterior which was thoughtfully and judiciously left unwired.

The tracery of wires was thick in front of the suits and down the arms and legs, the maze of tiny lines being connected to a single plug on a lead at the left hip. From this plug a flexible cable connected the person to a fixed electrical plug in the airplane cockpit.

Besides the suit, the rubber-soled flying-boots of sheepskin and gloves were heavily wired for heating purposes, each item being connected by a short cable to the sleeve and trouser leg. To link all this up was no light task. In addition to the thick electrically-heated gauntlets, the observers wore inner gloves of silk, provided by Messrs. Gieves. These enabled them to momentarily handle their delicate instruments and cameras with the big gloves off.

The crews growled strongly about their attire, but drew comfort from the hardships of their forerunners.

An old time Alpine mountaineer thus describes his outfit for a climb up Mont Blanc: "I had on a good pair of lamb's wool stockings, two pairs of gaiters, two pairs of cloth trousers, two shirts, two waistcoats, a shooting coat and overall, a blue woollen smock frock, a night-cap, three handkerchiefs round my neck, two pairs of woollen gloves and a straw hat, from which hung a green hood. For my eyes, a pair of spectacles and a green gauze veil."

Important, too, were the electrically-heated goggles made by Messrs. James Stephens, of remarkably ingenious design. Each eyepiece has two pieces of unbreakable Triplex glass, and is only

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one-sixteenth of an inch thick. Each again contains two layers of glass with celluloid interposed between. A minute air space separates the two glasses in which is a fine electric filament, visible to the eye, but disposed in a ring that does not impede the vision. Through these filaments runs part of the heating current, for the Triplex glasses without precautions, would rapidly frost over with thick ice. Still another cable connected these goggles to a socket, adding to the complexity of the skein of wiring in which the fliers were involved.

The voltage of the heating current was fourteen, at which figure each suit consumed eighteen amperes. In addition to the oxygen heaters and the suits, each camera had to be warmed, together with the spare spool magazines of the survey and the spare film boxes of the Newman ciné-cameras.

The voltage was, as we have seen, fourteen, but the dynamo being driven directly from the engine, this voltage tended to go up or down when the pilot increased or decreased the turning speed of his engine for climbing, or level flight at different altitudes.

It was essential that the voltage should not, in flight, rise above fourteen, since at that point the cut-out would have to operate in order to prevent short-circuiting or even burning out. If this occurred, all would go cold until the observer restored the circuit. To do this he must unscrew its lid in the air, actuate the rheostat, and then press up the contacts. On the other hand, should the voltage fall below twelve there was a grave danger of stoppage in the survey camera motors, collapse of the heating and other calamities.

It would have been possible to produce an automatic control for the voltage, but this would have added yet more to the

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medley of instruments in the crowded cockpit, any of which might go wrong at a critical moment.

We decided, therefore, that the observer should control the voltage by hand. True, this added to his numerous tasks in flight and threw a considerable responsibility and strain on his vigilance, but it simplified the installation.

He was provided with a large voltmeter and a sliding rheostat to be adjusted from time to time by hand. It was vital to watch the voltmeter, anticipate any alteration by the pilot in the engine speed, and not allow the needle to go above the danger point of fourteen volts, nor below the equally risky twelve volt marking.

Even with this simplification the electrical system was of necessity as complicated as that of a modern house, taking into account the provision for driving camera motors, lighting various indicating lamps, heating oxygen, suits, gloves, boots, a multitude of photographic gear, and driving a dictaphone.

A minor worry encountered in planning the electrical system was that accumulators, when exposed to very low temperatures, decline to give any appreciable current.

An accumulator was necessary in the main circuit to steady the dynamo voltage, and serve as an emergency supply to keep the vital oxygen heaters and heated goggles going in the event of a sudden breakdown of the dynamos.

The large amount of current required did not allow of the accumulators being heated, so we partially solved the problem by packing them in several layers of felt. Even so, if the dynamos for any reason gave out, the observer would have to instantly switch off the current to the clothing, camera heaters, and motors, to allow the minute supply from the battery going to the all-important goggles and oxygen heaters, and so keep the fliers alive and capable of sight. Even the dry cells of the telephones

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between pilot and observer were affected by the extreme cold, and for them heating arrangements had to be installed.

In truth, the telephones were never popular with the pilots, who considered the requests passed down to them by the observers distinctly tiresome, but toleration prevailed, although joy was evident when they went out of order.

It was to the skill and experience of Siebe Gorman & Co. that the expedition owed the success of the electrically-heated clothing and its satisfactory work in all the flights.

These details of organisation serve to illustrate the extent to which we were confronted by novel problems, and compelled to solve difficulties, often of an unexpected nature, calling for ingenuity and original research.

Even in an ordinary airplane there is little which is unnecessary; in our machines every detail was vital. A hitch in the working of any one of a hundred devices, or a failure to foresee each of a multitude of contingencies of the flight, might well have led to failure.



## Appendix II

### Duties of the Observers

**L**IST of forty-six duties each observer had to carry out during the flight over Mount Everest. Each had these tasks in writing before him, as the rarefied atmosphere at extreme altitudes tends to loss of memory.

Before taking off:

1. Receive oxygen report.
2. Inspect pressure gauges.
3. Switch on oxygen heater.
4. Check levels of Eagle camera.
5. Check filter, stop and exposure of Eagle.
6. Check filter, stop and exposure of P.14 camera.
7. Check filter and stop of film camera.
8. Check electric connections to Eagle.
9. Check electric connections to spare magazine.
10. Check electric connections to P.14.
11. Check electric connections to film camera.
12. Check electric connections to spare film storage.
13. Check and count dark slides for P.14.
14. Turn off generator switch.
15. Turn off camera switch.
16. Wind and set clock.
17. Drift sight to zero.
18. Close prone position hatch.

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19. Test telephone.
20. Uncap lenses.
21. Ink and set barograph.
22. Open prone position hatch slightly.
23. Turn on goggle rheostat about one quarter.
24. Pull out finder of ciné-camera.

At about 6,000 feet:

25. Turn on main generator.
26. Turn on camera switch.
27. Adjust rheostat to 13 or 14 volts.
28. Test body, hand and boot switches.
29. Ascertain drift and signal to pilot.
30. Check levelling of Eagle camera.
31. Check heating of P.14 camera.
32. Check heating of film camera.

Before reaching ground control:

33. Ascertain drift and instruct pilot.
34. Put drift on to Eagle camera.
35. Check levels of Eagle.
36. If light has changed, re-adjust stops of P.14 and film camera.
37. Check main generator voltage continually.
38. Turn on camera switch, if not already done.
39. Watch Eagle camera and ensure its starting; if not, warn pilot to switch on control box.

During flight to summit:

40. Watch for change of drift, and adjust.
41. Note change of light values, and adjust.
42. Watch footage-indicator of ciné-camera.

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N.B.—Ciné-camera holds six runs of about fifteen seconds each on each spool.

On turning, after summit:

43. Change Eagle magazine.
44. Ascertain drift and signal to pilot.
45. Put drift on to Eagle camera.
46. Change film spool as required.

## Appendix III

### The "Bristol" Pegasus S.3 Engine

**I**N THE selection of engines the most important points to be considered were the power available at great altitudes and for taking off and climbing with a heavy load, the weight per effective horsepower under various conditions, reliability, and fuel consumption. The type of engine selected had also to be one suitable for the airplane obtainable or such that the installation could be arranged with a minimum of structural alterations. As already seen the engine selected was the Pegasus S.3, manufactured by the Bristol Aeroplane Company.

Of the air-cooled, radial type, the Pegasus engine has nine cylinders of  $5\frac{3}{4}$ -inch bore and  $7\frac{1}{2}$ -inch stroke, giving a total swept volume of 1,753 cubic inches or just over 28 litres. It is fully supercharged to a rated altitude of 11,000 feet at its normal speed of 2,000 revolutions per minute, the rated power then being 525 brake horsepower. At its maximum permissible speed of 2,300 revolutions per minute, the power is 580 brake horsepower at 13,500 feet, while for taking off at sea-level it is 550 brake horsepower. The airscrew is driven at half crankshaft speed through a reduction gear, and therefore gives high efficiency for taking off and climbing, as well as when flying level.

In regard to the principles of supercharging, it may be explained that the cylinders of an unsupercharged or naturally aspirated engine cannot be filled with combustible mixture at a

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pressure exceeding that of the surrounding atmosphere, while in actual practice the induction pressure is usually somewhat less than this. Such an engine will give its normal full power at sea-level, but as the airplane climbs the power drops off in proportion to the density of the surrounding atmosphere, until at a height equal to that of Mount Everest the power will be only about 27 per cent. of that at sea-level. Obviously, then, an airplane fitted with a naturally aspirated engine will have but a limited ceiling and is quite unsuitable for really high altitude work.

To increase the power at altitude, it is necessary to force the mixture into the cylinders at a pressure exceeding that of the atmosphere in which the engine is operating, when the power will be increased in proportion to the difference in induction pressure. This difference is generally called the boost, and for convenience is reckoned from the standard atmospheric pressure at sea-level. Thus, an engine supercharged to plus 1 lb. boost is one in which the pressure of the charge in the induction system is 1 lb. per sq. in. above the normal pressure of 14.7 lb. per sq. in. at sea-level; while zero boost is just 14.7 lb. absolute pressure. When the engine is running throttled down, the boost is of course negative, say minus 4 lb. or minus 2 lb.

A supercharged engine, then, is one provided with some form of air compressor, fan, or blower, by means of which the cylinder charge can be increased in pressure, and the rated altitude of such an engine is the height at which the induction pressure can be maintained at the rated boost, usually zero. The Pegasus S.3 engine has a rotary fan, driven from the crankshaft by a train of gearing, drawing the mixture from the carburetor and forcing it into the cylinders so effectively that the rated boost of zero (14.7 lb. per sq. in. absolute) is maintained up to an altitude of 11,000 feet at normal speed. Above this height the power falls off

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as in the case of the naturally aspirated engine, but not so rapidly; at the height of Mount Everest the power is just half that for taking off at sea-level or nearly twice that of the naturally aspirated engine.











