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ON THE COVER

this month, taken from "Trapped in the Depths," we see our undersea voyagers faced with a new danger, from the great sea beast. But the beast is due for a great surprise, for the "ticklers" that extend around the submarine have been provided for just such moments as these.

NEXT MONTH

THE TIME VALVE, by Miles J. Breuer, M.D. We offer now to our readers the marvelous sequel to Dr. Breuer's "Fitzgerald Contraction." A flight of 200,000 years into the future may seem to us unimaginable, but our author accomplishes it in a vivid and realistic manner. And although he is not a pessimist, Dr. Breuer foresees a human race which is a sad degeneration from our present state of civilization. This is a most thrilling story and one of our well-known author's best.

THE WAR OF THE GREAT ANTS, by Jim Vanny. We humans give our small neighbors, the ants, credit for too little intelligence. Ants are really very clever creatures, and it is possible that they might, as our author pictures, be able to build up great cities, and make slaves of animals that at the present time despise them. Suppose ants could make slaves of us, and have us do their work? As our readers can realize, this is a most intriguing idea and Jim Vanny works it out in a corking adventure story.

A SUBTERRANEAN ADVENTURE, by George Paul Bauer. This story is approaching its most thrilling phases. Our author has an astounding imagination in his ability to picture totally strange worlds beneath the earth's surface. And in the incidents of this story there is both humor and tragedy in the attempts of our poor explorers to get out of the clutches of the Inner People. Don't miss this installment.

THE BAT-MEN OF MARS, by Wood Jackson. This aviation-interplanetary story comes now to its startling and dramatic climax. Overhanging our interplanetary travelers is the superstition of the Martians regarding a strange prophecy. But in the crater of Dir, where the Bat-Men live, lies the basis for sudden and overwhelming disaster. Can it be avoided; will the earthlings help the Martians? Be sure to finish this stirring story of two worlds.

AND OTHERS.

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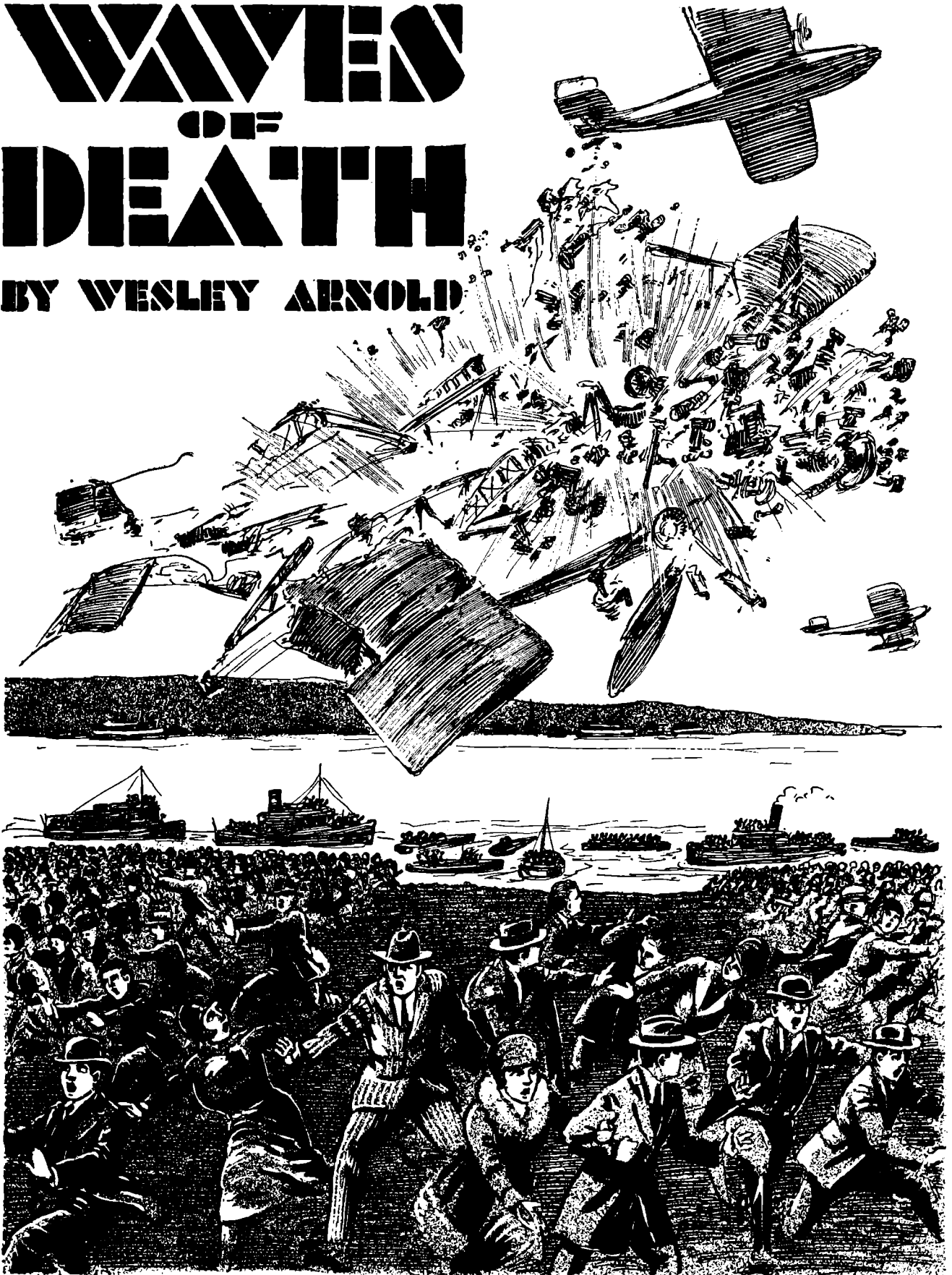
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WAVES OF DEATH

BY WESLEY ARNOLD



(Illustration by Paul)

Without warning of any sort the American plane was seen to disintegrate in the air. It broke into a thousand pieces that fell in long curves to the crater.

THE annual Schneider Cup race is rightly considered the world's most colorful and exciting spectacle. As long ago as 1929 nearly two million persons gathered along the banks of the Solent in the south of England to watch the winning of the cup for Great Britain with the then amazing speed of 328 miles an hour. The tremendous strides made in aviation in the two decades added equally to the importance and to the public interest with which the annual seaplane contest was regarded.

The 1948 race having been won by the United States, the duty of arranging the 1949 meeting and acting as host to the competitors fell to this country. Unusual secrecy attended the preparations of the two chief competitors, England and the United States. Already a month before the date set for the race, November 18, interest ran high throughout the world, while among the English-speaking peoples excitement and partisanship were at fever pitch. It was taken for granted that the record of 650 miles an hour made the year before would be broken, probably by flyers representing both nations, but which would triumph? France and Italy had also made entries, but the victory was generally conceded to lie between the English and American contestants.

American hopes were divided between Lieutenant Alfred J. Burton, holder of the world's record, and his close friend, Lieutenant "Jimmy" Wallace, a pilot of exceptional daring, but one who seemed eternally dogged by ill luck. Jimmy Wallace's sunny and care-free disposition had endeared him to the whole nation, and there were many who hoped that he, rather than his comrade, would emerge from the race on top. In a way he deserved the honor because of his bad luck in the 1938 race, when he was forced down by engine trouble after completing the first lap at the rate of 646 miles an hour. The two British pilots, Flight Lieutenant Richard Olerich and Flight Officer Ronald Briggs, were also well known to race enthusiasts. Two weeks before the date of the race the French decided not to participate, leaving only a fifth contestant, the Italian, Lieutenant Alborelli.

November 18 dawned clear, and developed into a perfect Indian summer day. All the preceding night special air liners had brought people by the hundred thousand from New York, Philadelphia, Washington, Chicago, and intermediate points. By early morning all available parking space had been taken by planes small and large, mostly from Baltimore and the surrounding country although registration members from every state in the union could be picked out. The shores of the Chesapeake were black with massed humanity hours before the start of the race. Water craft of every description dotted the river — gray men-o'-war, cruisers and destroyers, majestic ocean liners, sleek and beautiful yachts—all with their decks crowded with holiday-spirited passengers. Speed boats shot in and out between the large vessels, adding motion and gaiety to the scene.

At one o'clock President Smith and members of his official party passed through the cheering multitude and went aboard the flag ship *Texas*. The race officials and a select few of the aviation experts took up their place at the start-finish line of the 31-mile closed course. The five planes which were to compete were towed out to midstream to be in readiness for the start one hour later.

The British planes were remarkable for their almost complete lack of wings, having barely enough wing surface to lift them at high speed from the water. The American planes rested low in the water, in contrast to the others, which sat on their pontoons as if on stilts. Ultra-streamlined, the American planes appeared trim and competent. Only experts realized the remarkable work of the designer which made that trim appearance possible. The fifth seaplane, marked with the Italian colors, offered nothing novel in design.



WESLEY ARNOLD

A Thrilling Race

THE air was cleared of the hundreds of planes which had been droning and circling overhead at 1:30 o'clock, and the tensiety of the five million spectators increased with the realization that the big event was rapidly approaching. At precisely two o'clock the loud speakers scattered through the immense crowd carried the word that Flight Officer Ronald Briggs was ready for the starting bomb.

Two minutes later the signal was given. The shining LN-4 sprang forward, picked up a speed of more than 100 miles an hour in a half-mile run on the water, and flashed over the starting line to open the long awaited race. Traveling through the air almost faster than the eye could follow, the sound of its motor rising to a high soprano shriek which struck the ear almost like a blow as it passed, the small British plane flashed down the straightaway and banked vertically around the pylon at the first turn. It was obvious to those near-by that the limit of speed man had hitherto been able to attain was being set a peg higher before their very eyes. This was confirmed when the official announcement was made over the loud speakers a few minutes later that Flight Officer Briggs had made the first lap at the average rate of 678 miles an hour and had attained the

terrific velocity of slightly more than 700 miles an hour on the far straightaway. It was more than most of the observers had bargained for, and the confident assurance of the crowd in the American flyers was considerably dampened.

Twice more the speed marvel shot around the course, and as it flashed by the official barrier at the end of the third lap the bomb sounded for the first American starter.

A thrill ran through the crowd as its hero, Lieutenant "Jimmy" Wallace, took his plane gracefully into the air after a short run and flashed by the barrier. Could the *Dart* compete with the "LN-4" on equal terms? Would Jimmy be able to better the record set by the courageous Briggs on the first lap and maintained for almost half the seven

It is well known that sound or sound waves have very destructive effects on man-made structures. For example, it has been stated that if a violinist were to play continually a note on his instrument which was attuned to the natural period of vibration of the particles of a great building, he could cause the building to collapse!

Another instance of this is the ability of a troop of men, marching in step, to destroy a strongly constructed bridge by producing a continual vibration of the same frequency.

It is evident that the question of vibration is one which airplanes must contend with more and more as higher and higher speeds are sought.

Inasmuch as the mystery that surrounds the incidents of this story are so unique, we cannot give the reader any further hints. But we wish to say that the events that occur, which mystify the world and lead almost to an international war, form the basis of a most unusual story.

laps of the race? Had his steady run of bad luck broken at last?

The answers to the first two questions were quickly given. When the *Dart* passed the starting line the *LN-4* was at the far turn, a third way around the course on its fourth lap. Lieutenant Wallace lived up to his reputation for daring. The *Dart* cut the first pylon considerably closer than the other plane had done, literally mushing through the air as it banked squarely on its side. Without straightening it in the slightest, and relying solely on its velocity and the pull of its propeller to keep it in the air, the Navy ace shot over the short course to the second pylon, rounded it similarly and then leveled off for the straight drive down the far side of the course. To observers under its path, the *Dart* lost its identity as a plane and became a silver streak through the air. First a distant speck, it arrived overhead as a silver flash of light accompanied by a shrill and terrifying roar, which changed to a droning bass as it passed, and then instantly became a distant speck again. When the first lap was completed, "Jimmy" had cut down more than half the distance separating him from his opponent. His speed on the first lap was announced as 704 miles an hour, while he had made the unprecedented record of 730 miles an hour on the straight course!

What happened next will be described as it was witnessed through binoculars from the official stand under the start-finish line.

Lieutenant Wallace again saved time on the turns and rounded the second pylon at the western end of the course only a short distance behind his opponent. With the two planes separated by only a short distance the difference in speed was apparent, and there seemed no doubt that the *Dart* would pass the *LN-4* on the straight run to the eastern end of the course. At the center of the straightaway only some 200 yards separated the competitors, with the *Dart* making close to 750 miles an hour and rapidly overhauling the *LN-4*.

Then, without warning of any sort, the American plane was seen to disintegrate in the air! The sturdy seaplane, which had withstood the severest laboratory tests, broke up into a thousand parts that fell in a long forward curve to the water. The *LN-4* just ahead was seen to rock violently, but then steady itself. A second later a terrific roar, bringing its testimony at a much slower rate than that of light, told how the shrill sound of the *Dart's* motor had been enveloped in the reverberations of a tremendous explosion, from the effects of which the near-by British plane had barely escaped.

CHAPTER II

Angry Accusations

THE sorrow of the American public over the death of its favorite was intense. It was alleviated only in a small degree by the fact that the prized Schneider Cup had been retained for the United States by the victory of Lieutenant Burton when the officials hastily decided not to interrupt the race. But proud as every American was over the retention of the trophy, there was not a citizen of the United States who would have regretted its loss if the life of Jimmy Wallace could have been restored thereby.

But national resentment was aroused to its highest pitch the following morning when the belief gained general acceptance that the supposed "accident" must have been the result of a deliberate plot. Newspapers carried interviews with aviation experts and naval officials who declared that the explosion of the *Dart* could be explained only by the theory that a bomb had been placed somewhere in the lane. Not only in America but all over the world anger flamed high against the unidentified culprit who would perpetrate such a dastardly act.

But the tragic occurrence was not entirely explicable on the supposition that a bomb, craftily placed to avoid detection, had

exploded just at the intended moment. The theory, in fact, offered almost insuperable difficulties. How and when had the bomb been placed in the small seaplane? Like the others entered in the race, it had been under armed guard at every moment for several days preceding the race. Furthermore, how had the explosion been timed so exactly? If by a time bomb, then that bomb must have been placed in the plane on the day of the race, which was declared impossible.

The suggestion was advanced in some quarters that a small amount of a powerful explosive had been secreted in the plane when it was entirely overhauled three days before the race. The explosive, according to this theory, had been touched off during the race by means of a powerful ray of some undetermined nature which was directed against the speeding plane.

These theories, none of them satisfactory, only increased the public clamor for a thorough investigation of the tragedy, and swift punishment for the guilty. A means of carrying on the inquiry with the utmost thoroughness and the least possible delay through red tape was provided by the United States Senate, which promptly appointed an investigating committee. The resolution authorizing the appointment of the committee stated that its purpose should be to "take testimony of witnesses, inquire into certain rumors that have gained circulation, and by every possible means endeavor to bring to light all the circumstances attending and preceding the death of Lieutenant Wallace, or in any way bearing upon it."

CHIEF among the rumors referred to in the Senate resolution were two which had gained wide credence among the public, although they had no official sanction. The first was that a ring of gamblers who stood to profit by the elimination of Lieutenant Wallace had caused a time bomb to be placed in the seaplane, using as an intermediary a faithless guard whom they had bought over to their evil purpose.

The other rumor was treated with the utmost caution by the newspapers because of its serious international implications, but it was widely circulated among the general public. Its adherents believed that the death of their hero was the result of a huge plot to enable the British contestants to win the race. They believed that only through a miscarriage of the diabolical plan had Lieutenant Burton escaped a similar death and emerged victorious from the race.

Such was the seething condition of the public mind when the Senate investigating committee met for its first hearings. The first witness examined, Secretary of the Navy Warren, produced the departmental records covering the preparation for the race. It was revealed that both the *Dart* and the *Arrow*, its sister plane, had been given exhaustive trials in which both had exceeded 700 miles per hour on a straight course. In laboratory tests their ability to withstand the strain of much higher speeds through the air had been demonstrated beyond question. Secretary Warren also gave the details of the elaborate guard which had been maintained over the two planes. He was then excused and Lieutenant Burton took the stand.

The principal part of the pilot's testimony concerned a thorough examination of the *Arrow* made by mechanics under his direction and observation following the race, in which he had set a new world's record. The examination, he declared, showed that the *Arrow* had not been tampered with in any way.

"What was the condition of the plane after the race?" asked Senator Carter, who was chairman of the investigating committee.

"We found that the bolts holding the motor in place had been slightly loosened by the vibration. Otherwise everything was in perfect condition."

"Was that loosening of the bolts expected?"

"Yes. The vibration of the motor at high speed is very great," replied the noted pilot.

"So that your examination of the plane showed nothing that

was unexpected?"

"No."

As the committee chairman concluded, Senator Billings, a member from a western state, put a question:

"What were your relations with Lieutenant Wallace?"

"He was my best friend," the witness replied in an even voice.

Senator Billings stood for a moment looking into the eyes of the witness with a slight sneer on his face, and then resumed his seat. Lieutenant Burton was excused and his place was taken by Chief Petty Officer Lansing, who was in command of the detail assigned to guard the *Dart* on the night preceding the race. The preliminary questioning over, Senator Carter asked:

"Did any unauthorized person or persons obtain access to the seaplane's hangar on the night of November 17th?"

"No."

"Did you see any unauthorized person or persons in the near vicinity of the hangar during the night?"

The witness hesitated for a moment before replying.

"I don't know whether he would be considered privileged," he replied. "The only one I saw near the hanger was Lieutenant Burton."

Suspected!

SENATOR CARTER stared at the witness in surprise, and then cast a swift glance about the room. Lieutenant Burton, however, had left the room immediately upon being dismissed from the stand.

"Under what circumstances did you see Lieutenant Burton near the hangar?" he demanded.

"At about 10:30 that night," the Chief Petty Officer responded, weighing his words carefully, "I saw a small boat appear from behind the end of the hangar and quite close to it. I shouted to its occupant to come in to the pier and at the same time turned my pocket searchlight on the boat. Mechanic Greer, who was standing close to me, leveled his rifle at the man in the boat, but it was only a moment until we saw it was Lieutenant Burton. He was paddling a canoe."

"Did you report this?"

"No."

"Why not?"

"I didn't think anything of it at the time, after Lieutenant Burton explained that he was out just to calm his nerves. After the explosion of the *Dart* I remembered it of course, but I didn't want to say anything that would put the lieutenant in a bad light."

"Didn't you think it was your duty to report it?" demanded the inquisitor.

"I didn't know what to do," the witness responded.

Senator Carter turned and beckoned to a senate sergeant-at-arms. He whispered to the officer instructions which everyone in the room understood without hearing. The man left the room and everyone present knew as well as did Senator Carter that Burton was to be recalled and asked to explain why he failed to volunteer the information which had been left to the guard to reveal. As the chairman turned back to the witness, Senator Billings caught his eye.

"I should like the witness to explain why he thought it would put Lieutenant Burton 'in a bad light' if this nocturnal trip became known," he said.

"Why, I knew it might be misinterpreted," replied Lansing.

"Are you familiar with reports that Lieutenant Burton was envious of his comrade's popularity?" the Western Senator pressed on.

"I know they seemed to be good friends."

"But you have heard such reports?"

"Yes, I have."

"Do you know that Lieutenant Burton is a morose man, one

who might magnify a supposed slight in his mind out of all proportion?"

"No. He is quiet, but he has always been perfectly fair to the man under him, as I know from experience."

"That is all I wished to ask," said Senator Billings, resuming his seat.

"Then that will be all for the present," Chairman Carter told the witness. "You will be subject to call later."

THE next witness was a race official who described the occurrence of the explosion for the benefit of the record, although most of the senators on the committee had themselves witnessed the tragedy. He had been on the stand almost an hour when the same sergeant-at-arms returned and spoke in a low voice to Senator Carter. After a few more questions the chairman excused the witness and turned to his colleagues.

"Gentlemen," he said. "Lieutenant Burton has just been arrested by the local police officials on a charge of murder. I do not know what information they have that we lack, but I think we may adjourn until tomorrow morning, when we can determine how best to proceed with the inquiry. If it is possible to do so we will have Lieutenant Burton produced here for further questioning at that time."

As Senator Carter left the building where the committee hearing was held, he was conscious of a feeling of chagrin as a result of the way the limelight had been stolen from him. An hour earlier he had been temporarily the most important person in the world as a source of news. Now, while he did not consciously phrase it so in his mind, he knew instinctively that in the morning newspapers the story of the Senate committee investigation would have second place. It was because of this that Senator Carter, who himself had been ready to press relentlessly the investigation of the circumstances connecting Lieutenant Burton with the death of his comrade, now felt a strong desire to clear the accused man. If he could succeed in clearing up the mystery otherwise it would be a double satisfaction, since he would be at one and the same time thwart the local police and recapture the spotlight of public interest and approval.

As Senator Carter entered his hotel a man arose from a chair and walked toward him. The man was below medium height, stocky and dark. The committee chairman's eyes brightened as he saw him.

"Hello, Lem!" he exclaimed. "What are you doing here?"

"Howdy, Senator," the stocky man drawled. "I'm workin' on this job. Got in yesterday and been scoutin' around a bit. Thought I'd compare notes with you."

Senator Carter was secretly delighted. He had had experience with Lem Short on other investigations, and knew him to be about the best of the secret service agents.

"Come up to my room," he said. "We can go over the whole case there."

CHAPTER III

A Serious Charge

THE Senator made his guest comfortable and then came at once to brass tacks.

"What have you dug up on the whole thing?" he asked. "You know that Lieutenant Burton has just been arrested, I suppose."

"Yeah, I heard about it," said Lem Short, in his customary slow drawl. "Maybe they got the goods on him, but I don't think so."

"Just my idea, exactly," Senator Carter declared. "When you look at the thing calmly, it's ridiculous to suppose that Burton is involved."

"Now don't get me wrong, Senator. I ain't sayin' Lieutenant Burton's hands is clean. Maybe he knows more than he ought

to about what happened. What I said is, I don't think the police here know as much as I do, and I don't know near enough to hang Lieutenant Burton or anybody else."

Senator Carter considered this for a moment.

"What's back of the whole thing, Lem?" he asked. "What's your idea about it?"

"That's a big order, Senator," the secret service agent drawled. "I don't know as much about it as I'd like to—not yet, but I sure will. And I think when I do get to the bottom of the mess you'll find it goes pretty far—farther than you'll be willin' to follow it, maybe."

"We're out to clear this thing up," Senator Carter retorted, "no matter how far it goes. But what, exactly, do you mean?"

"Suppose a foreign government is involved—officially?"

The senator looked at his guest speculatively.

"If that is true it might be a matter which would have to be taken up with the State Department," he admitted. "Have you any proofs?"

"Nothin' that'll stand up. There's a thousand rumors, and some of 'em ain't all hot air. I've found that out, anyhow."

He paused for a moment to light a cigarette, and continued with more animation.

"Here's how it looks, Senator. This foreign government we're talkin' about—you know which I mean—wants the Schneider Cup. It's got two flyers entered—there, I've let it out! All right. Just how high it starts I don't know, but the British ambassador gets the word. Some way or other they reach Lieutenant Burton and he's rung in. But Jimmy Wallace can't be touched. He's out to win.

HOW do I know all this, you'll ask. Well, it's like this. A week before the race Jimmy told two friends that an attaché of the British Embassy had approached him, very diplomatic like, tellin' him he could have anything he wanted if he'd finish behind one of the Englishmen. Jimmy didn't get the whole details. He turned the man down in quick order.

"That part's straight enough, but how about Burton? Well, the Englishman dropped a hint to Jimmy Wallace that Burton wouldn't figure in the picture—that it all depended on Jimmy. But so far I haven't found anything to connect Burton directly with any such agreement. It'd be a hard thing to prove in any case, you see, because nobody that's involved in the agreement could afford to admit it."

"But don't you see where the whole thing falls down?" Senator Carter interrupted. "Burton didn't throw the race. He won it."

"Yeah," Lem Short said slowly. "I know. Sometimes human beings sink pretty low under the influence of jealousy and greed. What do you make of this fact? For a week before the race a lot 'o the so-called 'wise money' of New York gamblers was being offered on the British flyers winnin' the cup. Then the day before the race they all began coverin'. And instead of bettin' on the United States keepin' the cup they were gettin' double the odds by puttin' the money smack on Lieutenant Burton to come in first."

Senator Carter gasped.

"You think that Lieutenant Burton first agreed to 'throw' the race, knowing that Wallace was to be killed, and then doubled-crossed the conspirators by selling out to a ring of gamblers?"

"Why not?" the secret service man said in a matter-of-fact tone. "As far as that went he was safe. Nobody could 'squeal' on him. And maybe he didn't know Jimmy Wallace was to be killed. Maybe it wasn't ever planned for him to be killed. It would have served the same purpose, you know, if the seaplane had been destroyed just before the race. The only thing about that is that Jimmy Wallace may have known so much that he had to be put out of the way."

Lem Short reached for his hat, and stood up.

"You understand, Senator, that I'm tellin' you things I couldn't say in court for lack o' proof. That's the line I'm workin' on, and if you can make any use of it you're welcome."

As he was turning the knob of the door he stopped to ask a question.

"By the way," he said, "who's this guy, Gray, that's snoopin' around?"

"I don't know whom you mean," replied the senator.

"Now? I supposed he was workin' for you, though I don't know what good a college professor is on this job."

"A college professor? Who is he?"

"Oldish gink named Charles Gray. He's been around a couple o' days. Was out this afternoon to look over the *Arrow*. He must have some pull, or he'd never have got that far. Since he's not workin' for you I'll look him over. I guess he's harmless."

After Lem Short ambled out with the promise to report any definite developments, Senator Carter sat down to think over the case. Could it be that the secret service agent was near the truth in his suspicions of double-deep treachery involving Lieutenant Burton with a ring of gamblers and with some representative of the British government? If the latter were true, it was a matter to be handled with the greatest care. With public feeling as high as it was, any official sanction of the rumors of British responsibility for Jimmy Wallace's death would be a match set to a powder train. Where a positive disclosure of such a fact would lead no man could say. Certainly the matter must not be even hinted officially without positive proof; and even if it were true, could the fact be established? Senator Carter knew Lem Short to be a very thorough investigator. He might go off on the wrong trail but he would follow it to the end, and, finding it wrong, he would go back to pick up the right scent. On the whole, Senator Carter was well pleased to know the secret service man was on the job.

CHAPTER IV

Burton Explains

LIEUTENANT BURTON, haggard after a sleepless night, was arraigned before a committing magistrate the following morning. A sailor who had been on guard testified to the nocturnal visit which the senate committee had learned of the preceding day. He added the statement that the lock on the sea end of the hangar showed signs of having been tampered with. A police officer then told of a visit to Lieutenant Burton's rooms and the discovery there of a bottle containing dynamite.

On this evidence, which his attorney characterized as ridiculous, Lieutenant Burton was ordered bound over for the grand jury.

At the flyer's own request, however, the magistrate gave instructions that he be permitted to go before the senate committee again, and he was accordingly taken from the courthouse directly to the room where the committee was waiting to begin its session.

In addition to the committee members and stenographers the room was crowded with newspaper reporters and as many persons as could jam themselves into the space provided for the public. The accused man entered with his head erect, and took the seat pointed out.

"Lieutenant Burton," began the committee chairman. "There has been testimony here that you were seen on the night preceding November 18 in the vicinity of the hangar where the *Dart* was kept. Is that true?"

"Yes," the accused man replied in a colorless voice.

"Now, why did you fail to mention that fact when you were examined here yesterday?"

Lieutenant Burton straightened in his chair, and looked about him defiantly before answering.

"Because it had nothing whatever to do with the subject of your inquiry. For the same reason," he added bitterly, "I said nothing about having in my room an explosive mixture consisting partly of dynamite, with which I had been experimenting on a small rocket motor. However, since these things have been seized on to prove that I murdered Lieutenant Wallace, I am willing to tell you anything I can."

"Can you throw any light upon the explosion of the *Dart*?"

"No. That is as complete a mystery to me as it is to anyone. If I knew anything that would aid you in that respect, I would have told you about it yesterday.

"Suppose you tell the circumstances of your canoe ride."

"I will tell you exactly what happened, but it is so simple that I do not expect you to believe me. The whole world seems to have gone crazy, or it would never have believed that I had anything to do with the death of my comrade.

"Lieutenant Wallace and I occupied rooms on the same floor of the Wilson Hotel. On the night before the race I was feeling nervous in anticipation. I was not afraid of anything, because I had tried out the *Arrow* thoroughly and knew it was in perfect condition. It was just the strain of waiting and anticipation of the race that was affecting me. I knew this would leave me as soon as I entered the cockpit for the race, but still it was important that I get a good night's rest, and I was afraid I would not.

"About nine o'clock Lieutenant Wallace knocked at my door and came in. He seemed perfectly calm and not at all disturbed by the emotions that affected me. However he saw that my nerves were on edge. He suggested that I go down to the river and row or paddle for an hour or so and then go directly to bed. I realized that his advice was good, and so I took it. I was paddling back to the pier when I made a mistake, found my bearings, and was about to pull out again when I was challenged by the guard."

DURING this recital an attendant approached Senator Carter and handed him a penciled note, which the chairman glanced at and then continued to hold in his hand. Senator Billings, whose belief of the aviator's story was evident by his expression, looked at the chairman inquiringly at this juncture, but received no enlightenment.

"I identified myself to the officer in charge of the guard," Lieutenant Burton continued, "and then paddled directly back to the pier I had left an hour or an hour and a half before. When I returned to the hotel I saw a light in the room occupied by Lieutenant Wallace, and knocked at the door. He was reading. I told him that his prescription had had the desired effect, and then went to my own room and retired. I have told you all that occurs to me about the matter, but I will be glad to answer any questions."

Senator Billings rose slowly to his feet, but the nimble chairman of the committee was ahead of him.

"If you will pardon me, Senator," he said apologetically.

Turning to the witness, Senator Carter said:

"We may wish to question you in a few moments, Lieutenant Burton. In fact, I am sure some of the senators are not entirely satisfied with your testimony. However, I am going to excuse you temporarily, while we listen to the testimony of another witness."

"I protest against this dismissal of the witness at this time," Senator Billings began. "Surely we should examine him thoroughly now when we have the opportunity."

"Lieutenant Burton will remain in the room under guard of the sergeant-at-arms and of the policeman assigned to guard him," the chairman replied. "Before we go ahead with his testimony I think we should hear another witness who is present. Dr. Smith, will you take the stand, please."

A middle-aged man, whose scholarly appearance was in-

creased by the gold-rimmed spectacles which he wore, walked forward with a firm step and assumed the seat vacated by Lieutenant Burton. He cast a friendly glance about him at the assembled senators, newspapermen and audience.

"There Was No Explosion!"

SENATOR CARTER, always the showman, was obviously pleased at having the opportunity to introduce this surprise witness. It was clear he wished to make the moment as dramatic as possible.

"You are Dr. Charles Andrews Smith?" the chairman inquired formally.

"Yes."

"Head of the Physics Department of the University of the East?"

"I have the honor to hold that chair."

"You are known throughout the world, I believe, as an authority in matters of physics, particularly in the field of that science devoted to the study of atoms?"

"Really, Senator," protested the witness, who seemed embarrassed and annoyed, "you place me in a difficult position."

A member of the committee came to the witness' aid.

"The eminence of Dr. Smith in his own field is well enough known not to need confirmation from his own lips," he remarked dryly.

Having properly stressed the importance of the witness, Senator Carter turned to the business of the committee, that is, to investigate the death of Lieutenant Wallace.

"In this note which was passed to me, and which bears your name, Dr. Smith, you say that you can explain the explosion of the *Dart* which resulted in the death of Lieutenant Wallace. Do you mean that you know what caused the explosion and the circumstances of it?"

"Did I really write 'explosion?' the witness said in surprise. "I scribbled the note in haste, but I should not have been so careless."

Senator Carter hastily consulted the piece of paper which he held in his hand and then said in some confusion:

"No. You did not use the word. It was my own. However, I . . ."

"Ah, you relieve me," the witness interrupted, with a smile. "You see, there was no explosion."

"But I do not understand you," Senator Carter protested. "Five million people saw the plane explode!"

"Perhaps I overstress a technical point," the eminent scientist replied. "Nevertheless I must insist that there was no explosion, but there was instead a very curious and unique occurrence which resembled one."

Lieutenant Burton had been watching the surprise witness intently. At this unexpected statement he glanced momentarily at the police officer at his side, and then again concentrated his attention on the scientist. If he knew what was coming he showed no sign of it.

"Will you please explain what you mean?" Senator Carter requested.

"I trust you gentlemen will forgive me if I seem to adopt a professional manner in my explanation," the scientist began, engagingly. "As I said, what happened to the seaplane, *Dart*, with its tragic consequence, was so strange that possibly no one else has hit upon the true fact. I say this without any conceit, because the truth is so simple that any student of physics would need only to be set on the right track of inquiry to arrive at the same result I have reached.

"Nevertheless, the solution of the mystery was not easily arrived at. If it were not for the fortunate fact that I am at present engaged in certain experiments concerned with acoustics* I feel sure that I, at least, should not have hit upon it."

* The study of the properties of sound.

DR. SMITH hesitated for a moment, and then turned to Senator Carter.

"Since I am not addressing an audience of fellow physicists," he said, apologetically, "I feel that I should go into some detail, so that you may follow my explanation exactly. Can you grant me the necessary time?"

"You have declared that you can explain the cause of the explosion—or whatever it may have been," the committee chairman responded. "In view of that, and of your eminence as a scientist, we naturally will gladly give you all the time you require."

"Thank you," said the witness, gratefully. "I will try not to tire you too much.

"I wish first to mention something which was noticed by most of the persons who witnessed the race. Most of them probably did not understand the cause of what they noticed, although it is quite simple. I refer to the fact that when an airplane is approaching at high speed its motor has a high, soprano tone, but when the plane is going away from the hearer the note of the motor is much lower in the scale. The same thing on a smaller scale may be noticed in the whistle of a train which is approaching or receding from the hearer at high speed.

"We all remembered from our school-books, of course that sound consists of a wave motion. Musical notes are caused usually by some vibrating object which causes waves of a definite frequency, and it is the frequency that determines their pitch. If the object vibrates rapidly the frequency of the waves is high and so is the pitch of the note which the ear distinguishes. If the object vibrates slowly, the frequency of the waves and the pitch of the note is low. These waves, I should mention, travel through the air at the rate of 1,090 feet per second.

"Now the sound of a motor is caused by individual explosions of gas in its cylinders, the separate explosions occurring so rapidly that their repetition at regular intervals causes what we can recognize as a musical note. The pitch of the note is determined by the frequency of the explosions, so that when the motor is running at high speed the pitch is high. As the speed of the motor is decreased the note becomes lower and lower until finally it ceases to be a musical note at all, and we can distinguish the separate explosions.

An Amazing Discovery

THE condition that I have described, however, applies only when the motor and the hearer are at rest relative to one another, as when the seaplane, for example, is resting on the water and the hearer is also at rest. In these days of 'relativity' we have learned also to consider what happens when the observer and the observed are in motion relative to one another. From that viewpoint it is clear that when the airplane is approaching the observer rapidly, each separate explosion in the motor occurs a little nearer to him than the last, with the result that the sound waves are crowded together. This is the same as saying that the frequency of the waves, as noticed by our observer, is higher, and therefore the pitch of the motor's note, as he hears it, is higher. When the plane is receding rapidly the waves are further apart; the frequency is lower and the pitch of the note which he hears is lower.

"I should point out that the pilot of the plane, who is at rest relative to the plane because he shares its motion, detects no such difference in pitch. The motor sounds just the same to him in motion as it would if the plane were on the water, except that it does not sound quite so loud, since the waves have to travel somewhat further from their point of origin to catch him, and consequently are somewhat spent—that is, they have lost some of their intensity."

Dr. Smith paused and looked about him to make certain that he was holding the attention of his listeners.

Senator Billings, apparently, had been awaiting the opportunity.

"All this is very interesting," he growled, "but this is not a class room in physics, and I fail to see the connection between what the witness is saying, and the explosion of the *Dart*, which it is the purpose of this committee to investigate, as I understand it."

"Dear me," sighed Dr. Smith. "I thought I had impressed you with the fact that it was not an explosion. However, I possibly should apologize for going into this, to me, very interesting discussion. What I wished to say, really, was that I observed this phenomenon during the race and it was that which put me on the track that led to the solution of the strange occurrence which you insist upon calling an explosion. I will try to be more brief.

"You see, I too, was very much puzzled to explain what happened. By a very fortunate chance it happened that I was aboard a friend's yacht almost under the spot where the *Dart* met with its unfortunate end. I had been noticing the peculiarity which I mentioned in the sound of the British plane. As it approached on each lap the sound of the motor was quite high pitched. It rose from a murmur in the distance to a shriek of great intensity as the plane approached directly overhead. Immediately it changed to a bass note as the plane passed, and rapidly faded to a murmur again. That happened on the first three laps which the *LN-4* made around the course. On the next lap I again noticed the phenomenon in the case of the British plane, and also in the case of the *Dart*, which was close behind.

"It was quite exciting on the next lap, the fifth for the *LN-4* and the second for the *Dart*. The two planes were very close together as you undoubtedly recall. The *LN-4* approached with the same shrill sound, which changed to a low note as it passed overhead. But there appeared to be something wrong with the *Dart*. I listened for its high tone above the low note of the other plane, and there was a fraction of a second when I should have heard it quite distinctly.

TO my amazement there was not a sound from the approaching plane! It was just as if its motor had stopped dead, and yet that was impossible, because it was visibly overhauling the *LN-4*. Of course, I had only a fraction of a second, as I say, to observe this most unusual phenomenon, but I am quite positive about it.

"The next moment my ears drums were almost split by a tremendous noise. The yacht trembled and I was thrown to the deck. At the same time I saw the seaplane directly above me fly apart. As I picked myself up, horror-stricken, as everyone was, I shared the general impression that there had been an explosion. But as I thought it over I was more and more impressed with the opinion that something much more unusual than a mere explosion had occurred. For one thing, I had noticed something peculiar about that tremendous sound. As I have said, I am engaged in certain research work in acoustics, and I have trained myself to distinguish between different sounds with great accuracy. It seemed to me that I had heard a single explosion in the cylinder of a huge motor.

"The explanation seemed almost within my grasp, but I could not quite catch it. Then suddenly it came upon me, and the simple answer explained everything—my failure to hear the motor of the *Dart* as it approached, and then that great sound which resembled one single cylinder explosion, greatly magnified.

"I made a rapid calculation in my mind, and the result made me positive I had found the solution. My calculation was simply to translate the speed of sound waves in the air, 1090 feet per second, into miles per hour. It works out to slightly more than 743 miles an hour. You, gentlemen, I see from your expressions, have begun to see the light. You have jumped

to the conclusion that the *Dart* was traveling at the exact speed of sound waves when it broke into pieces, and in that assumption you are undoubtedly correct. It remains only for me to explain exactly how sound waves, in this instance, became waves of death.

"As I tell you, the correct explanation of the accident occurred to me shortly after it happened, but not before the conclusion of the race. Otherwise I should have felt it necessary to try to prevent a repetition of it. Fortunately the accident was not repeated, and therefore we can safely assume that Lieutenant Burton, the winner of the race, at no time attained the speed of 743 miles an hour, although he must have come dangerously close to it at times.

CHAPTER V

Waves of Death

IT remained for me to demonstrate by laboratory tests that my explanation was the correct one, and this I have done. I was handicapped by the inability to reproduce the conditions exactly, but I have nevertheless satisfied myself completely as to what happened.

"The phenomenon of sound reinforcement is well known and is utilized in some form in most musical instruments. If we set up in the laboratory two tuning-forks that vibrate to the same pitch, and strike one of them, the other will vibrate in sympathy. The resultant note will be twice as loud as if there were only one tuning-fork. Or if we have four tuning-forks of the same pitch and strike only one, all four will vibrate, producing a sound four times as loud, and so on.

"This is practically what happens in the case of an airplane traveling at the speed of sound waves. Instead of having a number of motors we have one motor which moves along with the original sound wave, reinforcing it with each additional explosion in a cylinder. The plane, of course, is moving through the air at the rate of 1090 feet per second, and if the explosions of the motor at high speed are, say, 500 explosions per second, then at the end of a second the plane will be accompanied by a single sound wave representing the accumulation of the waves, caused by 500 cylinder explosions. At the end of the second second it will have the accumulation of 1000 cylinder explosions and at the end of a minute there would be the terrible sound as from 9000 cylinder explosions..

"If the plane passed through this critical velocity of 1090 feet per second with a steadily increasing speed it would outrun the sound waves, and the pilot would not hear his motor at all, assuming that the exhaust is back of the cockpit.

"But the *Dart* had attained its maximum speed. Its velocity remained exactly that of sound waves, with the result that the sound of its motor was continually accumulating until it resulted in that tremendous roar which accompanied its disintegration."

The audience in the room, including the members of the senatorial committee, sat in dumbfounded silence as Dr. Smith ended his explanation. They were unable so quickly to give

up their belief that some human agency had caused the wreck of the *Dart*, and the death of Lieutenant Wallace. Was it possible that the daring pilot's death had resulted from his flouting of an impersonal and immutable physical law of which he was not even aware?

A look of understandable relief, mixed with doubt, flickered across the face of the accused Lieutenant Burton. Assuming his own innocence of the charges against him, it was clear that he was as much mystified as were the others in the scientist's audience.

Senator Billings was the first to shape his doubts into words.

"What you say seems logical, so far as it goes," he admitted, addressing the witness. "I believe there is little doubt that the *Dart* was going about 740 miles an hour when this tragedy occurred, and the sound of its motor must have acted in the way you describe. Grant that, but you cannot expect us to believe that this strongly constructed and very sturdy seaplane was torn to pieces by nothing more than a big noise!"

"Why, no," Dr. Smith replied promptly. "Not by the noise. The plane was torn apart by the vibrations of the plane caused, or rather strengthened, by the sound wave. The destructive power of sound waves is proved in common experience by the breaking of windows and the rattling of dishes at considerable distances, sometimes miles, from the center of a severe explosion, even though the sound waves in such instances have already lost by far the greatest part of their original intensity. In the case under consideration, the *Dart* was directly in the center of the greatest intensity of the sound wave, and the plane moved on while the intensity of the wave constantly increased. It was necessarily only a matter of time until the strength of the wave became so great that the plane would be unable to withstand the strain.

"Moreover the seaplane was peculiarly subject to the destructive effect of that particular sound wave, because its parts were already vibrating to the frequency of the motor, 500 explosions per second, transferred directly through the rigid frame of the plane.

"It has often been stated that a violinist could cause the 150 story Empire Building to collapse if he could play a note exactly attuned to the natural frequency of the building. In the case we are considering, the seaplane, vibrating at the frequency of its motor, was literally torn to pieces by the force of the built-up sound wave and the increased vibration caused by it."

Dr. Smith's explanation of the tragedy ended the investigation by the senate committee. It was accepted by his fellow scientists, and furnished sufficient grounds for quashing the legal proceedings against Lieutenant Burton. As a result of the explanation of the death of Lieutenant Wallace, when such high speeds became common a few years later, airplanes were equipped with automatic signals to warn the pilot when his speed was dangerously close to the velocity of sound waves. When they received the warning signal, the pilots either decreased their speed or accelerated it very rapidly, so as to pass quickly through the critical velocities around 743 miles per hour. However, the death of Jimmy Wallace remains to this day unique in the annals of aeronautics.

THE END.