SUBJECT THE HINDENBERG

FILE NUMBER 62-48190

SECTION NUMBER TWO

SERIALS 43-65

TOTAL PAGES 147

PAGES RELEASED 144

PAGES WITHHELD 03

EXEMPTION(S) USED b7C, b7D

FEDERAL BUREAU OF INVESTIGATION

Form No. 1
THIS CASE ORIGINATED AT NEWARK, NEW JERSEY

FILE NO. 70-396

REPORT MADE AT	DATE WHEN MADE	PERIOD FOR WHICH MADE	REPORT MADE BY
WASHINGTON, D. C.	6/17/37	6/12-16/37	[redacted]

TITLE	CHARACTER OF CASE
DESTRUCTION OF AIRSHIP "HINDENBURG"	GOVERNMENT RESERVATION MATT

SYNOPSIS OF FACTS: Files of the Investigation Board of the Department of Commerce relative to Hindenburg disaster failed to reflect any information of value upon which an investigation by the Bureau might be reasonably warranted in connection with any possible sabotage or other Federal violations within the investigative jurisdiction of the Bureau. Mr. South Trimble, Jr., Solicitor, Department of Commerce, and Chairman of the Hindenburg Investigation Board, will request the Bureau's further cooperation in the event additional data obtained by him should justify such request.

- P -

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 9-16-88 BY SP1 [illegible]

DETAILS: On June 11, 1937 Agent received instructions from Mr. E.A. Tamm of the Bureau to examine the files relative to this case in the office of Mr. South Trimble, Jr., Solicitor, Department of Commerce, with a view to extracting therefrom any data in which the Bureau would be interested from the standpoint of any indications of violations of any Federal Law over which the Bureau has investigative jurisdiction.

Accordingly, Agent interviewed MR. SOUTH TRIMBLE, JR., Room 5868, Department of Commerce Building, who stated that between May 10th and May 28th, 1937 the Department of Commerce Investigation Board, of which he is the Chairman, conducted daily oral hearings at the U. S. Naval Air Station at Lakehurst, New Jersey, in connection with the dis-

APPROVED AND FORWARDED: Guy Hottel SPECIAL AGENT IN CHARGE

DO NOT WRITE IN THESE SPACES: 62-42195 43 JUN 18

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2

aster of the German Airship "Hindenburg", which occurred on the afternoon of May 6, 1937, and that at his request two representatives of the Federal Bureau of Investigation, Inspector E. J. Connelley, and Special Agent in Charge W. S. Devereaux, attended the hearings in the capacity of observers.

Mr. Trimble stated that the Investigation Board had received numerous letters offering all sorts of suggestions and opinions as to the probable cause of the disaster; that while a great number of letters suggesting possible sabotage have already been given proper consideration by the Board, he felt that there might be some other information in these letters which could probably be handled with more thoroughness by the Federal Bureau of Investigation, than by the Investigation Board; that having this in mind, he furnished the Bureau with certain letters and other data, in order that the Bureau might render any cooperation deemed advisable and appropriate by the Bureau in connection with this subject matter.

Mr. Trimble furnished Agent with six sections of correspondence, consisting principally of letters from passengers, eye witnesses, and persons who claimed to have observed the flight of the Hindenburg, and who have been interested enough to express their ideas, conclusions, and opinions concerning the possible causes of the disaster. A review of these letters and correspondence by Agent indicates that about 30% of them appear to place the responsibility for the disaster upon mechanical defects, 50% upon static discharges and other aerial causes, and about 20% upon possible sabotage perpetrated by Jews and directed against the Hitler regime in Germany.

Merely for reference, and not to be used in any future investigation of this subject matter, Mr. Trimble invited Agent's attention to a strictly confidential memorandum dated May 29, 1937, prepared by the German Technical Commission, at the request of the Investigation Board of the Department of Commerce, on the subject of the possibilities of sabotage in connection with the loss of the Hindenburg.

In this memorandum the possibilities of sabotage by the use of bombs installed in the ship and operated by clockwork, or affected by barometric bellows, or possible sabotage by incendiary bullet fired from the ground, are particularly mentioned. It is stated in this memorandum that such a bomb could have been installed in Frankfurt only by a person having access to the remote parts of the ship, without being noticed by the crew, and set to a probable time shortly after landing, or to operate as soon as a certain barometric pressure would have been reached; that the device could also have been installed by a passenger

during the voyage, if he had gained access to the after part of the ship unaccompanied and unnoticed; further, that an incendiary bullet could have been fired by a silenced gun from the proximity of the ship, the flame caused by the bullet penetrating the gas cell and resulting in explosion.

This memorandum concludes by stating that the German Commission proposes to be on the lookout during the salvaging of the wreck for any apparatus which might indicate an act of sabotage. In this connection, Mr. Trimble informed Agent that the salvaging of the wreckage is still in progress under the supervision of the Navy Department at the Naval Air Station at Lakehurst, but that so far no indication of any bomb or fuse or bullet has been discovered.

The first section of the material turned over to Agent for examination contains carbon copies of correspondence, with notations thereon indicating that on May 26, 1937 Mr. Trimble transmitted to the Federal Bureau of Investigation five letters received by the Board in the course of the investigation of the Hindenburg disaster. A review by Agent of these five letters, (4 letters and 1 postal telegram), indicates, however, that none of the information furnished therein has any apparent value, meriting investigation by the Bureau. Bureau file No. 62-48190 shows that photostatic copies of these papers have been transmitted to the Newark Field Division, under date of June 3, 1937, with a request that Captain C. E. Rosendahl, in charge of the Naval Air Station at Lakehurst, New Jersey, be interviewed as to what inquiries, if any, he desired made in connection therewith.

The second section of the material furnished Agent by Mr. Trimble, marked "Hindenburg Letters", consists of letters of suggestions as to the possible cause of the disaster and of statements from some members of the ground crew concerning their observations upon the landing of the Hindenburg. There are two letters in this section suggesting possible sabotage; one is dated May 27, 1937, from K. W. Beck, 1830 Rittenhouse Square, Philadelphia, Pennsylvania, addressed to Commander Hugo Eckener, stating in substance that he is quite sure he saw a flash from an airplane that flew over some minutes before the Hindenburg landing; that he cannot be certain about that flash, but it so looked to him, and that a bullet shot from that plane into the tail end of the ship might have caused the explosion.

Another letter, alleging a similar observation, has been found in Section 4, marked "Letters Left by Colonel Breithaupt of the German Mission". This letter is dated May 12, 1937 and is from Joseph Dermoutz, 138 - West 62nd Street, New York City, addressed to the Ger-

4

man Consulate, New York, stating that he observed the flight of the Hindenburg over New York City and when he looked out of the window of his place of employment, he saw an aircraft flying close by the body of the stern of the Hindenburg, which looked very strange to him and to others nearby. It appears from letters and memoranda prepared by the Investigation Board that no importance has been attached to letters of such character, as it has been quite definitely established that there were no planes flying in the air in the vicinity of the Naval Air Station at least one-half hour before the arrival of the Hindenburg and during the landing maneuvers of this ship.

The other letter, dated May 25, 1937, suggesting possible sabotage, was from Dr. Nathaniel A. Davis, President of the "Planetaryans", 1247 - West 5th Street, Los Angeles, California, wherein it is opined that a woman agent of the Nazi government might have placed a time fuse which might have burst prematurely, causing the explosion. There is another letter, in Section 5, from the same writer, dated May 9, 1937, wherein the suggestion is expressed that in view of the fact the Hindenburg was insured for $3,750,000.00, and that the Hitler government was short of funds, it is possible that the disaster was caused by a Hitler agent, acting on Hitler's orders.

Section 3, marked "Letters from Passengers", consists of letters sent by passengers of the ill-fated Hindenburg in reply to letters written to them by the Investigation Board, seeking any information in their possession which would shed light upon the causes of the disaster. None of these letters suggested possible sabotage, however. In this connection, Mr. Trimble called Agent's attention to one of the letters dated May 29, 1937, written to the Investigation Board by one Joseph Spaeh, of 240-16 Alameda Avenue, Douglaston, L. I., telephone: Bayside 9-1727, a passenger on the Hindenburg. Mr. Trimble informed Agent that the Bureau had been requested by Commander Rosendahl to institute an investigation of this man, who claimed to be an acrobat, and who had access to the rear portion of the ship, where his dogs had been kept, and that he, Mr. Trimble, understood that the Bureau has been keeping surveillance of this individual in an effort to find out something about him. The letter of Spaeh states, in substance, that at the moment of the first explosion he was on the window farthest up toward the nose of the ship, in the dining room, taking a photograph of the ground crew, and that he jumped to the ground, without seeing any flames; that his wife, standing on the ground, was able to see the first flames shot out from the stern of the ship.

b1c

The Washington Field Division file No. [redacted], concerning Joseph Spaeh, (whose name is erroneously spelt Spach), contains a letter dated May 21, 1937, from the Special Agent in Charge of the Newark Field Division, requesting that all available information be obtained at the Passport Division, State Department, concerning an application for passport, or other information relative to this person's recent trip to Germany. This letter mentions the fact that Joseph Spaeh had access to the aft portion of the airship to tend two dogs which he owned and which were confined in the aft freight room; that inasmuch as Spaeh had access to the rear portion of the ship, some suspicion attached itself to him, as at various times he was in the stern of the ship unaccompanied.

This file contains a report made by Special Agent R. P. Burruss, dated May 24, 1937, at Washington, D. C., indicating that the Passport Division, State Department, Internal Revenue Bureau, Treasury Department, and the Immigration and Naturalization Service, Department of Labor, have no record relative to Joseph Spaeh. In view of the fact that Mr. Trimble advised Agent that he has not as yet been informed of any developments in this matter and further that no subsequent information concerning this angle of the case is reflected in the Washington Field Division file, or in the Bureau file, this matter is called to the attention of the Office of Origin, without setting out an undeveloped lead concerning it.

Section 4, marked "Letters Left by Colonel Breithaupt of the German Mission", consists of letters written originally in German and translated into English. Mr. Trimble informed Agent that Colonel Breithaupt was a member of the German Commission sent over by the German government to work in cooperation with the Investigation Board of the Department of Commerce; that the originals of these letters had been turned over to Mr. Trimble by Colonel Frederick Von Boetticher, Military Attache of the German Embassy here. Agent carefully noted the contents of the letters, 12 in number, the writers of practically all of them holding "Jews or Nazi plotters" responsible for the destruction of the Hindenburg, without, however, furnishing any information whatsoever which would warrant an investigation. This opinion was fully shared by Mr. Trimble and Mr. Dennis Mulligan, Chief of Enforcement Division, Bureau of Air Commerce, with whom Agent conferred relative to this matter.

Sections 5 and 6, marked "Correspondence (Miscellaneous) - Group 3", contain numerous letters from all parts of the country, furnishing opinions as to the possible causes of the disaster and offering suggestions for the improvement of future air travel, et cetera. The writers of a number of these letters claimed they observed some mechanical defects on the ship while flying over Boston, New York and Newark, basing their opinions on the "I told you so" theory. Others

believed that static discharges caused the explosion; some believed an incendiary bullet fired from the ground, or a bomb with time fuse placed in the mail or freight, caused the disaster, and that Jewish Communists or Nazi plotters were responsible for this fatal crash. However, not one of these letters suggesting possible sabotage contained any reasonable basis upon which an investigation appears to be advisable and practical. This opinion, too, has been shared by Mr. Trimble and Mr. Mulligan, at the time Agent discussed with them the contents of the material turned over to him for examination.

On June 15, 1937, Mr. South Trimble, Jr. furnished Agent with a confidential letter dated June 8, 1937, addressed to the Department of Commerce, by Captain Allan S. Farquhar, Acting Director of Naval Intelligence, U. S. Navy, wherein it is stated, in substance, that information has been obtained from a confidential informant to the effect that two days prior to the loss of the Hindenburg, this informant was in Atlantic City, where, while sitting on a flight of steps leading from the boardwalk to the beach, near the Steel Pier, he overheard snatches of conversation between two men, who were unaware of his presence; that these two men were well dressed, spoke English, but when they became aware of the informant's proximity, they reverted to the use of a foreign language, which sounded like either German or Yiddish; that one of these men spoke of having recently come from abroad on a cargo vessel that "landed at New York at 43"; that talking about the Hindenburg, one of the men said, "This will be her last trip"; "Everything, including the long range tracers, is in readiness"; "Soon now Hitler will not drive anymore Jews out of Germany"; that after noting informant's presence, the two men departed, but that shortly thereafter one returned, accosted the informant, asked whether he had overheard their conversation, and when the informant replied in the negative, he was told to "let it go".

Mr. Trimble informed Agent that the writer of the above mentioned letter has been requested by him to have this confidential informant call at Mr. Trimble's office for interview, and that he would notify an Agent of this office so that he may be present when this man is being interrogated.

Mr. Trimble informed Agent further that he had in his possession certain information concerning an individual who has made some fantastic accusations against some high Government officials, involving narcotic and white slave traffic act violations, and that this individual claims to be a decoder of secret codes used by the so-called "Red Network". Mr. Trimble stated that he transmitted this information to the Bureau on June 11, 1937, and that he will let the Bu-

reau know of the date on which this man, who is in New York, will call at his office so that an Agent might be present when Mr. Trimble interrogates him in connection with his accusations.

In connection with this matter, Mr. Trimble furnished Agent, for reviewing purposes, the following correspondence:

(1) Letter dated May 15, 1936, from Hans Omenitsch, 3545 - 82nd Street, Jackson Heights, New York, addressed to Joseph B. Weaver, Chief Inspector, Bureau of Navigation and Steamboat Inspection, Department of Commerce, Washington, D. C., enclosing therewith a decoded message and key entitled "Secret Internationalist Codes Operated in New York Press", and purported to be operated by the "Red Network". This letter states that information relative to the secret codes operated in the New York Press had been furnished certain members of Congress and that: "The Codes appear to be operated by an invisible super-government and they are decidedly anti American". Agent secured photostatic copies of the code diagram and of the letter of transmittal, which are attached to the Bureau copies of this report, one copy of which having been personally delivered to Mr. E. A. Tamm of the Bureau on June 16, 1937, for submission to the Technical Laboratory, if it is so deemed advisable.

(2) Letter dated May 26, 1936, from J. D. Weaver, Director, to Hans Omenitsch, acknowledging the receipt of the letter and enclosure, and advising that the matter will receive the attention of the Board of Inquiry which the Secretary of Commerce is about to appoint for the purpose of investigating problems concerning labor conditions.

(3) Letter dated May 7, 1937, from Tom O'Connor, Harrington Hotel, Washington, D. C., to the Secretary of Commerce, wherein, referring to the above correspondence, he stated, among other things, "For about two years an associate of mine, Mr. Hans Omenitsch, an expert decoder, has vainly tried to bring to the attention of the public and the Congress the fact that a secret subversive code is being run in the press from day to day, from article to article, in an almost unbroken continuity." It goes on to state that "to date nothing seems to have been done to save America from the terrible damage these codes have been and are daily doing and they are perpetually being flaunted in the very face of Congress in the every day Washington press." Continuing, O'Connor refers to the investigation of the Hindenburg disaster initiated by the Department of Commerce and states "as I have Mr. Omenitsch available and as he has decoded enough information indicating willfully planned sabotage I wish to go on record as not only asking, but demanding that Mr. Omenitsch be called

8

immediately and be made demonstrate his findings."

(4) Western Union telegram, dated May 11, 1937, Washington, D. C., from Tom O'Connor, to South Trimble, Chairman, Hindenburg Investigation Commission, Lakehurst, New Jersey, referring to the absence of any acknowledgment of his previous letter and stating among other things: "Party available here ready to testify and present positive evidence that crash was planned sabotage by a specific group and was positively intended to bring about foreign complications deliberately precipitating war."

(5) Letter dated May 13, 1937 from Dennis Mulligan, Member, Investigation Board, Lakehurst, New Jersey, to Tom O'Connor, in care of Congressman E. E. Cox, House of Representatives, Washington, D. C., acknowledging above letter and telegram and requesting to have O'Connor's associate transmit to the Board a statement showing what information he has and in what respect it may be connected with the Hindenburg disaster.

(6) Letter dated May 16, 1937, from O'Connor, to Mr. Mulligan, stating in reply that he has "requested this party to compile his data and he has agreed to start doing this immediately and expects to have it in complete form for presentation just as soon as compatible."

(7) Letter of May 27, 1937, from Tom O'Connor, 109 - West 49th Street, New York City, Telephone: Columbus 5-92997, addressed to Mr. Dennis Mulligan, referring to the above letter, and stating "I am advised by this party that he now has all data in shape and is ready to present his complete findings to your committee, but on condition that an acceptable number of members of the House and Senate be on hand." Continuing, O'Connor advised in this letter that the findings which his associate will present to the Investigation Board do not call for any secrecy, "since Congress is already in the possession of full information regarding the secret code through which the sabotage activities were directed and information exchanged both prior to and after the crash."

As previously stated, Mr. Trimble advised that he will request the presence of an Agent of the Bureau when he interrogates Omenitsch. In this connection, Agent conveyed to Mr. Trimble a message given him by Mr. E. A. Tamm of the Bureau, suggesting that Mr. Trimble contact Mr. Tamm by phone prior to his interview with Hans Omenitsch, Mr. Tamm intimating that the Bureau is quite famil-

9

iar with this man on account of his numerous suggestions which he had offered in connection with the Lindbergh kidnaping case.

- PENDING -

10

102.3-

Hans Omenitsch,
35-45-82nd Street,

Jackson Heights, N.Y.
May 15th 1936

Mr. Joseph B. Weaver,
Chief Inspector,
Bureau of Navigation and Steam Boat Inspection,
Dept. of Commerce,
Washington, D.C.

Dear Sir:

I enclose herewith a decoded message relative Maritime matters.

It is self explanatory.

Information relative secret codes operated in the New Press has also been furnished Senators Borah and Mc Kellar, as well as Representative Zioncheck and the matter has been put on Congressional record, April 23rd 1936.

The codes appear to be operated by an invisible super-government and they are decidedly anti American.

If you hope to succeed with your investigation of Marine Sabotage it will be necessary to expose the RED NET which is responsible for them .

This can be done through their codes as it possible to trace them all and read History backward. The information is in the hands of the Authorities , but for reasons of their own they suppress it and the codes go on operating with variations and changes as soon as more information is furnished.

Yours truly,

Hans Omenitsch.

ANS OMEN 1354 — JACKSON HEIGHTS, N.Y.

5/15/36

RE: SECRET INTERNATIONALIST CODES CONCEALED IN NEW YORK PRESS:

N.Y. JOURNAL: "SEEIN' STARS" 5/12/36

"A STEER HIDE 8 FT. HIGH ~~X~~ BY 7 FT. WIDE WAS ORDERED BY MUSICAL SUPERVISOR ABE MEYER TO MAKE A DRUM TO FURNISH BATTLE, THUNDER AND EARTHQUAKE SOUND EFFECTS."

KEY

1	-	D	U	N	-	H	T	A	M	V	C	E	W	F	-	H
2	S	N	Q	A	-	S	M	M	E	R	I	R	-	7	T	R
3	T	U	H	R	E	I	U	D	B	E	S	E	E	Y	F	E
4	C	O	T	E	L	N	R	T	A	P	U	D	D	B	8	E
5	E	S	R	D	T	R	D	R	R	U	M	R	I	H	-	T
6	F	E	A	N	T	U	A	E	O	S	Y	O	W	G	E	S
7	F	K	E	J	A	F	E	Y	S	L	B	S	-	I	D	A
8	E	A	D	H	B	O	K	E	I	A	D	A	T	H	I	-

DUN-SUN-
NEAR-TRUTH-RED-COT (CODE) RAED
FEAR-ANT-EFFECTS-
FAKE-AD-
EDNA-TAB-RUF-LETTERS-
ORDAT-KEY-EYE-EAR
BAR-SOS-ROSE-
AMERIC-TRAP-RUM-ROW-
SUM-LBS-ROSA-SAT-AD-
RED-EYE
AMERIC-RED-CREW-EYE-EDI-
ROW-WGES-
EDI-IDA-HILDA-

EXPLANATIONS:

(1) CODES IN COMMERCIAL ADS IN SUN
(2) INF. FORM SEN. BORAH-MCKELLAR-
(3) REFERENCE TO MY WORK
(4) DECOY ADS.
(5) INFORMATION LEAKS OUT AS SOON AS GIVE
(6) RED NET HEADQUARTERS
(7) WASHINGTON, D.C. AND WALL STREET
(8)
(9) ADS: SAT. NEW YORK TIMES & TRIBUNE
(10)
(11) ACTS OF SABOTAGE & RED STRIKES
(12) " " " "
(13) RED NET WORK PERSONALS-

AT LEAST 3 MAJOR CODES AND A COMBINATION OF THEM ARE USED - I HAVE TRACED THEM ALL - THE CODES APPEAR TO BE RELAYED AND TRANSPOSED BY JAFSIE-CONDON - THE WORD JAFSIE-LAFSIE APPEARS THROUGHOUT - A MORSE SENDING AND RECEIVING STATION APPEARS TO OPERATE FROM SEA-GIRT-N.J. ACCORDING TO RECENT DECODINGS - RELAY AND CUE CODES ARE OPERATED IN THE COMIC STRIPS - " " " " APPEAR " IN RADIO-CRIME & MYSTERY PROGRAMS

Alan Onsmith

936 Raymond-Commerce Building,
Newark, New Jersey.

June 16, 1937.

Commander G. E. Rosendahl,
U. S. Naval Air Station,
Lakehurst, N. J.

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 9-16-81 [illegible]

Dear Sir:

This will acknowledge your letter of June 10, 1937 enclosing a letter dated at New York, May 23, 1937, and signed with the initials, "G. O. G.".

At this time allow me to thank you for your consideration in forwarding this letter to me for appropriate attention.

Very truly yours,

W. S. DEVEREAUX,
Special Agent in Charge.

WSD:ML
CC-Bureau

FOI/PA #
APPEAL #

~~INDEXED~~

62-4110-43X

13

936 Raymond-Commerce Building
Newark, New Jersey

June 22, 1937.

Commander C. E. Rosendahl
United States Naval Base
Lakehurst, New Jersey

Dear Commander Rosendahl:

Re: AIRSHIP HINDENBURG;
Govt. Reservation Matter.

I am transmitting herewith a copy of a letter dated June 21, 1937 which was received by the Bureau from [redacted] concerning the Hindenburg disaster.

This copy is being forwarded to you for your information and for your appropriate attention.

Very truly yours,

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 9-16-88 BY SP1A

W. S. DEVEREAUX,
Special Agent in Charge

WT:cc
Enc. (1)
70-15
cc-Bureau

INDEXED
mi

62-48110-938

FEDERAL BUREAU OF INVESTIGATION

14

JOHN EDGAR HOOVER
DIRECTOR

Federal Bureau of Investigation
United States Department of Justice
Washington, D. C.

PEF:DM

May 19, 1937.

MEMORANDUM FOR MR. TAMM

Time - 2:30 P. M.

Re: Hindenburg.

I called SAC Devereaux at Lakewood, New Jersey, 669 and informed him that the Director had authorized the investigation requested by Commander Rosendahl concerning the personal history, background, criminal tendencies, etc., of Joseph Spach, passenger on the Hindenburg. I told Devereaux he should point out to Commander Rosendahl that in the event this person was a German citizen, naturally our investigation would not disclose much information. Devereaux stated that Spach's passport reflected he was an American citizen.

Devereaux also stated that subsequent to his first call to the Bureau, Commander Rosendahl had approached him concerning the warning which has been mentioned in this matter. Devereaux states that this warning was received by Captain Antone Witteman, who is the commanding officer of the Graf and Captain Lehmann, deceased, who was in command of the Hindenburg. Mr. Devereaux stated that these two were the only persons who knew anything about the supposed warning and that they had imparted their information to no one other than the German Ambassador. According to Mr. Devereaux, Hugo Eckener had suggested to Commander Rosendahl that Captain Witteman be interviewed for the purpose of securing information concerning this warning and Rosendahl has requested Devereaux to do this. I told Devereaux he should take no action in this connection until the Director had an opportunity to pass upon the request of Commander Rosendahl, after which he would be advised if he was authorized to make the interview.

Devereaux is proceeding with the investigation as to Spach.

Respectfully, 62-48190-44

P. E. FOXWORTH.

1877

JOHN EDGAR HOOVER
DIRECTOR
PEF:CDW

Federal Bureau of Investigation
United States Department of Justice
Washington, D. C.

May 19, 1937.

Time - 10:20 A.M.

MEMORANDUM FOR MR. TAMM

Re: Hindenburg.

SAC Devereaux telephoned me from Lakehurst and said that late last night he received a call from Commander Rosendahl, who said that he wanted to discuss certain matters with him personally which he could not explain over the telephone. Mr. Devereaux went down to Lakehurst and contacted Commander Rosendahl, who said that during the course of the testimony which has been given in connection with this matter, it developed that the fire probably originated in or about Motor No. 4 of the ship. The testimony showed that the passengers were not allowed to frequent the vicinity of the motor gondolas without being accompanied by an officer or a member of the crew. However, the testimony showed that there was on board this ship an acrobat by the name of Joseph Spach. This man had two pet dogs which were placed in a compartment in the aft of the ship, and he had a habit of going to see his dogs without being accompanied by an officer or a member of the crew. The innuendo of the entire matter is that this acrobat could have climbed out on the motor gondola, removed the cover on the exhaust pipe of the motor, and allowed the flames to set fire to the fabric and explode the hydrogen.

Commander Rosendahl wanted to know if the Bureau could conduct an investigation of this man, with particular reference to his personal history, his background, criminal tendencies, etc. This man was placed in the hospital at Asbury Park, New Jersey due to injuries received at the time of the incident, but he was discharged and left his forwarding address as Douglaston, Long Island.

I told Mr. Devereaux that this request would be submitted to the Director for a decision, and we would let him know what to do about it.

Respectfully,

P. E. FOXWORTH.

WESTERN UNION

MAY 19 1937

WM1 21 GOVT COLLECT

NEWARK NJ MAY 19 745A

DIRECTOR FEDERAL BUREAU OF INVESTIGATION

US DEPT OF JUSTICE

PROCEEDING LAKEHURST EIGHT AM VIA BUREAU CAR CAN BE REACHED CARE OF COMMANDER ROSENWAHL RETURNING NEWARK SEVEN PM MURPHY ACTING

DEVEREAUX.

304AM

Find out what he is going ~~there for~~. I understood from Connelley that we had tactfully withdrawn from this case.

Memo to Director.

4/11/41

RFP:DMS

June 22, 1937.

62-43190 -35

Special Agent in Charge,
Newark, New Jersey.

Re: Airship Hindenburg;
Government Reservation
Matter.

Dear Sir:

Reference is made to your letter to the Bureau dated June 10, 1937 covering the transmittal of the original plaster cast of the footprint previously submitted in life size photograph designated as specimen Q18.

Examination of the cast failed to disclose sufficient detail to permit an identification, but the word appearing on the cast might possibly be "SECOND". The word "SECOND" is sometimes stamped on inferior or second-grade merchandise.

It was noted at the time the plaster cast was received at the Technical Laboratory, that it had been broken during transit to the Bureau.

The specimen submitted as the original of Q18 is being returned to your office under separate cover by Railway Express.

Very truly yours,

RECORDED 62-48190-47

John Edgar Hoover,
Director.

JUN 1937

18

RFP:DMS

Invoice of Contents from
FEDERAL BUREAU OF INVESTIGATI
WASHINGTON, D. C.

June 18, 1937.

SAC, Newark

Airship Hindenburg;
Government Reservation
Matter.

62-48190-35 Original of 62-48190-24 Q18, (Plaster cast).

RAILWAY EXPRESS.

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 9-16-78 BY SP1 [illegible]

62-48190-47

DEPARTMENT OF COMMERCE

OFFICE OF THE SECRETARY

WASHINGTON

June 21, 1937.

Mr. John Edgar Hoover,
Director, Federal Bureau of Investigation,
Department of Justice,
Washington, D. C.

Dear Mr. Hoover:

This will acknowledge receipt of your letter of June 16th, regarding the findings of your Bureau in its examination of the photograph and original negative purporting to depict the airship HINDENBURG approaching the mooring mast at Lakehurst prior to the explosion which caused its destruction.

We sincerely appreciate your cooperation in this and in all other matters in which you have rendered us valuable assistance in our investigation of the HINDENBURG accident and we hope that if at any time this Department can assist you in any way you will not fail to call on us.

Very truly yours,

South Trimble, Jr., Chairman,
Department of Commerce
Investigation Board.

MP

RECORDED 62-45770-48

JUN 24 1937

FEDERAL BUREAU OF INVESTIGATION

Form No. 1
THIS CASE ORIGINATED AT NEWARK, NEW JERSEY

FILE NO. 70-396

REPORT MADE AT	DATE WHEN MADE	PERIOD FOR WHICH MADE	REPORT MADE BY
Washington, D. C.	6-22-37	6-19-37	LOUIS LOEBL LL:GS

TITLE	CHARACTER OF CASE
DESTRUCTION OF AIRSHIP "HINDENBURG"	GOVERNMENT RESERVATION MATTER

SYNOPSIS OF FACTS: Additional letters reviewed at the Department of Commerce, but no information of value found concerning possible sabotage. [redacted], confidential informant of Naval Intelligence, [redacted] interviewed; [redacted] in addition to the valueless information previously furnished.

b1C
b1D

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 9-16-88 BY SP1A6cm

- P -

REFERENCE: Report of Special Agent Louis Loebl dated at Washington, D. C., June 17, 1937.

DETAILS: AT WASHINGTON, D. C.

On June 18, 1937, MR. SOUTH TRIMBLE, JR., Solicitor, Chairman of the Hindenburg Investigating Board of the Department of Commerce, informed Agent by telephone that he received from Commander C. E. Rosendahl of the Naval Air Station, Lakehurst, New Jersey, an additional batch of letters relating to the Hindenburg disaster matter and that he desired to have the letters reviewed for any possible evidence of sabotage suggested therein. Pursuant to this request, Agent examined at the office of Mr. Trimble the additional file of forty letters sent to Commander Rosendahl from various parts of the country offering suggestions as to the cause of the loss of the Hindenburg. The theories advanced by the writers of the majority of the letters coincide practically with those expressed in the

APPROVED AND FORWARDED: Guy Hollaway SPECIAL AGENT IN CHARGE

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21

letters previously reviewed: static electricity, St. Elmo's Fire (a phenomenon consisting of collected static discharges), faulty frame work, or defective bonding in the aft section of the ship, electric charges generated by the thunder storm, etc.

There were five letters suggesting possible sabotage caused by either a tracer bullet fired from an airplane at the time of the landing or by an incendiary bullet fired from a silent rifle from a car parked near the landing place. Everyone of these letters, however, are merely general expressions of opinions or conclusions based upon theories of hatred toward Germany on the part of its enemies both Jewish and Spanish.

With reference to the information furnished the Hindenburg Investigating Board by the Naval Intelligence concerning certain information emanating from a confidential informant, as mentioned on Page 2 in reference report, Mr. Trimble stated that Commander Keisker of the Naval Intelligence had called on him in person and confidentially advised him that the name of the confidential informant was [redacted]

b1c
b7D

b7c
b7D

[redacted]

Special Agent William S. McKinley of this office informed Agent that on Saturday afternoon, June 19, 1937, at about 4:45 P.M. (shortly after Agent interviewed [redacted], while he was on duty at the Washington Field Office, a man telephoned stating [redacted] that a few minutes ago [redacted] Hindenburg disaster to a man who [redacted] a Department of Justice man and that he was trying to verify this because he was afraid that the man, speaking with a foreign accent, might have been sent by the German Embassy to check up on him in connection with the information he had in his possession concerning the Hindenburg catastrophe. Agent McKinley stated that the man who phoned expressed himself as being greatly relieved by the information given him that the person who interviewed him was really a Department of Justice man.

b7c
b7D

- PENDING -

23

62-48190-5

FEDERAL BUREAU OF INVESTIGATION

JUN 28 1967 P.M.

DEPARTMENT OF JUSTICE

FIL

Mr. Tolson

Mr. Baughman

Mr. Clegg

Mr. Coffey

Mr. Dawsey

Mr. Egan

Mr. Foxworth

Mr. Glavin

Mr. Harbo

Mr. Joseph

Mr. Lester

Mr. Nichols

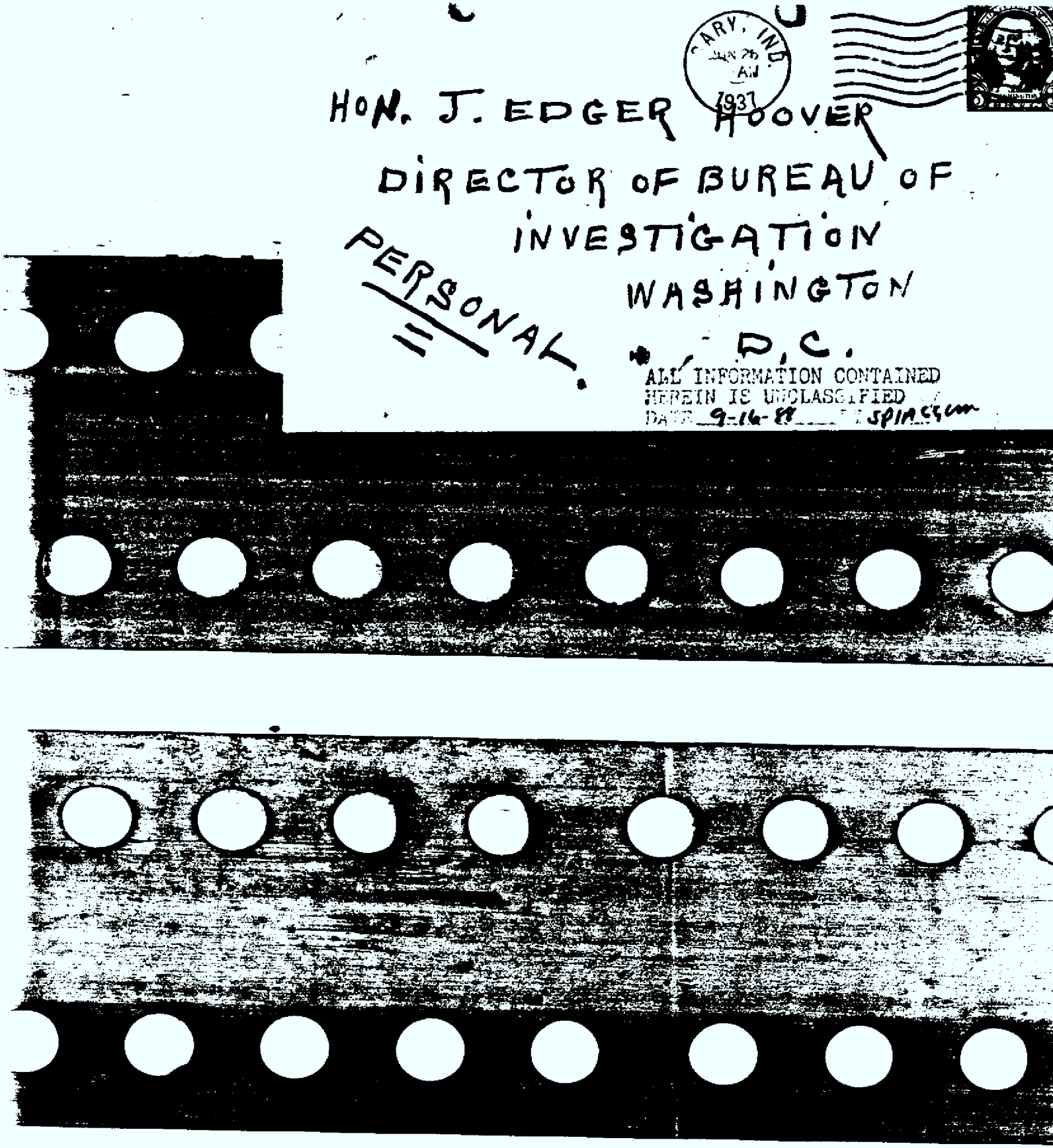
Mr. Quinn

Mr. Schilder

Mr. Tamm

Mr. Tracy

Miss Gandy


GARY, IND.
JUN 26
AM
1937
HON. J. EDGER HOOVER
DIRECTOR OF BUREAU OF
INVESTIGATION
WASHINGTON
D.C.
PERSONAL.
ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 9-16-88 BY SP1 ASG cm

25

MR J. EDGER HOOVER
DIRECTOR OF BUREAU OF
INVESTIGATION,
WASHINGTON. D.C.
DEAR SIR
DO YOU WANT TO KNOW WHO
SHOT DOWN THE DIRIGIBLE
HINDENBURG IN NEW JERSEY?
IT WAS POLICE LIEUT OF DET
ECTIVES, RALPH DE-
MARTENI NEW YORK CITY
POLICE DEPT. HE SHOT IT DO
N, WITH A MAXIM SILENCE
GUN, BY ORDERS OF MAYOR
LAGUARDIA, NEW YORK CIT
MR HOOVER, SEARCH
LIEUT DE MARTENI'S
HOUSE, FOR THE GUN.
MR HOOVER ITS TRUE

b7c [redacted]

THE MAXIM SILENCER GUN

Federal Bureau of Investigation

United States Department of Justice

Washington Field Division, Room 2266,
Washington, D. C.

June 25, 1937.

MEMORANDUM FOR MR. E. A. TAMM

RE: DESTRUCTION OF AIRSHIP "HINDENBURG";
GOVERNMENT RESERVATION MATTER

As reported verbally, Mr. South Trimble, Jr., Solicitor, Department of Commerce, phoned me at my home at 9:00 P.M., June 23rd, and requested me to be present on June 24th in his office at a conference which he had arranged with [redacted] and [redacted] Inasmuch as no definite hour was set for this conference, I held myself available on June 24th at a moment's notice, but these men failed to appear. In the meantime, at your suggestion, I reviewed Bureau file No. [redacted] obtaining therefrom data concerning [redacted] and [redacted] which I subsequently conveyed to Mr. Trimble for his information.

Mr. Trimble has just informed me by phone that [redacted] called him at 2:00 P.M. today and informed him that [redacted] who stayed at a local hotel under an assumed name, had hurriedly left the city yesterday and returned to New York.

The attached memorandum, dated April 29, 1937, from Mr. C. A. Appel to Mr. Tolson, which was extracted from the Bureau file, is returned herewith.

Respectfully,

Louis Loebl

LOUIS LOEBL,
Special Agent.

LL:FLB
70-396
Enclosure

62-48190-51

27

4-750 (Rev. 4-17-85)

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XXXXXX
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FEDERAL BUREAU OF INVESTIGATION
FOIPA DELETED PAGE INFORMATION SHEET

3 Page(s) withheld entirely at this location in the file. One or more of the following statements, where indicated, explain this deletion.

☒ Deleted under exemption(s) b7C with no segregable material available for release to you.

☐ Information pertained only to a third party with no reference to you or the subject of your request.

☐ Information pertained only to a third party. Your name is listed in the title only.

☐ Documents originated with another Government agency(ies). These documents were referred to that agency(ies) for review and direct response to you.

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65-48190-51

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X NO DUPLICATION FEE X
X FOR THIS PAGE X
XXXXXXXXXXXXXXXXXXX

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XXXXXX

FBI/DOJ

DEPARTMENT OF COMMERCE
OFFICE OF THE SOLICITOR
WASHINGTON

July 1, 1937.

Honorable John Edgar Hoover,
Director, Federal Bureau of Investigation,
Department of Justice,
Washington, D. C.

Dear Mr. Hoover:

I wish to acknowledge the receipt of and thank you for your confidential report dated June 24, 1937, upon Joseph Spaeh, a passenger on the last flight of the airship HINDENBURG.

You ask to be advised whether the Board of Inquiry desires further investigation regarding Spaeh. Dr. Eckener and the members of the German Commission seemed to be especially interested in this passenger. They dwelt in private upon the fact that he was the owner of a dog kenneled in the stern part of the ship and after a day or so out of Frankfort apparently was permitted the liberty of going to the after part of the ship without being accompanied by an Officer or members of the ship's crew. The steward reported that Mr. Spaeh had made the statement that his dog was so attached to him that the animal would not eat unless he were present at the time. It is my understanding that the German authorities are conducting a close investigation of Spaeh and his activities abroad.

We are enclosing for your information a copy of the letter sent to the Investigation Board by Mr. Spaeh. I have nothing further to offer at this time. I would suggest that the investigation be held open for a time in order to see the reaction of Mr. Spaeh.

62-48190-5

RECORDED & INDEXED

The willing and able cooperation of yourself and your organization is greatly appreciated.

Cordially yours,

Seth Richardson

Seth Richardson, Jr.,
Solicitor.

Douglaston, N. Y. May 29, 1937

Bureau of Air Commerce
Investigation Board
Naval Air Station
Lakehurst, N. J.

Dear Sir:

In your communication of May 24, re - information regarding the available facts, conditions and circumstances, relating to the accident to the LZ Hindenburg, I would like to say, being that I was a Passenger, that:

I was at the time of the first Explosion, on the window furthest up toward the Nose of the Ship, in the Diningroom, facing the Hangar, taking a Photograph of the Groundcrew, With the suddenness of the whole thing, there was no time for me to observe, just where the whole thing was happening or where it started from, from the way we were rising for a second and from the reflection of the explosion on the ground, I could imagine that we had gone up in flames, I jumped out from a great height and when I landed on the ground ran off without looking back, thus at no time, did I see any flames, nor do I have the slightest idea, nor could I have, toward the solution of the accident.

My wife, who was standing on the ground, however was able to see the first flames shoot out toward the stern of the Hindenburg with the rest following up in a few seconds.

This is all the information I can give.

sincerely,

(Signed) Joseph Spaeh
Douglaston, Long Island, N. Y.

FEDERAL BUREAU
OF
INVESTIGATION

From: Laboratory

Date 6/3/ 193

____ Mr. Nathan	____ Mr. McClintock
____ Mr. Appel	____ Mr. Miller
____ Mr. Baughman	____ Mr. Parsons
____ Mr. Beach	____ Mr. Pfafman
____ Mr. Blackburn	____ Mr. Pickering
____ Mr. Burgess	____ Mr. Renneberger
____ Mr. H. M. Clegg	____ Mr. Schilder
____ Mr. Clark	____ Mr. Q. Tamm
____ Mr. Conrad	____ Chief Clerk
____ Mr. Dingle	✓ Files
____ Mr. Donaldson	____ Laboratory
____ Mr. Engert	____ Stenographer
____ Mr. Lovett	____ Messenger
____ Mr. Major	____ Mail Room
____ Mr. McCarthy	____ Mr. ____

Place in "Hindenburg" file.

62-48190-NR1

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DATE 9-16-88 SP1A6bm

See Me ____
Please Handle ____
Bring File ____

E. P. COFFEY

3

U. S. DEPARTMENT OF COMMERCE

Air Commerce Bulletin

Issued Monthly by the Bureau of Air Commerce

Vol. 9 WASHINGTON, AUGUST 15, 1937 No. 2

CONTENTS

Airways Improvement Projects Announced by Department of Commerce

A program of airways construction representing plans for expenditure of about $5,000,000 of the $7,037,800 which the Department's appropriation act for the fiscal year 1938 authorizes for establishment of air-navigation aids has been announced by the Bureau of Air Commerce, Department of Commerce. The act appropriates $3,037,800 for this purpose for the fiscal year 1938 and authorizes the Department to obligate itself for an additional $2,000,000 prior to July 1, 1938, plus a further $2,000,000 prior to July 1, 1939.

The Bureau's program is designed primarily to improve the existing system of air-navigation aids by modernizing present aids and providing new facilities to fill in gaps in the present system.

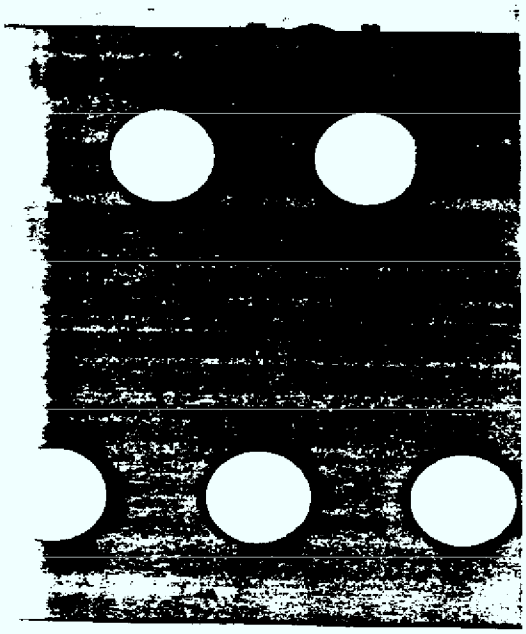
An outstanding feature is adoption for Bureau radio stations of simultaneous transmission of both voice and radio range signals on the same frequency, which has been made possible by the Bureaus' development work. With simultaneous transmission the radio range signals transmitted to keep the pilot on his course are sent continuously. Voice broadcasts are made from time to time on the same frequency, with the range still in operation, and the pilot may listen to whichever form of transmission he requires at the moment.

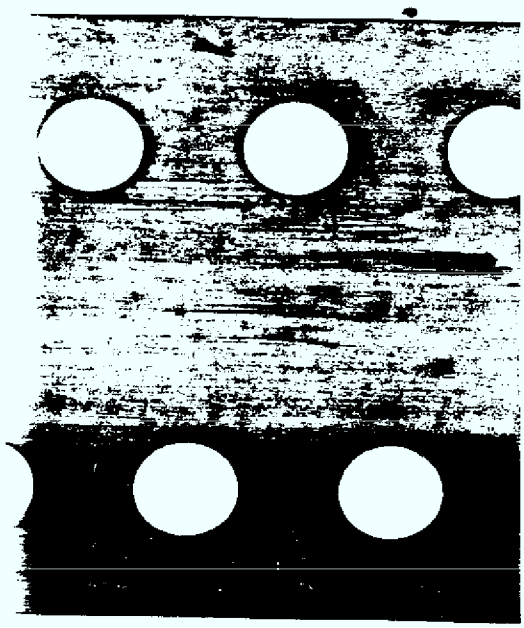
As it is necessary that range signals and voice broadcasts be on the same frequency, stations operating on the older basis have to interrupt the range signals to broadcast voice. Although the intervals are brief, not exceeding 3 minutes, they may occur at times when pilots urgently need radio range guidance. Simultaneous transmission does away with these interruptions.

Service installation of ultra-high frequency transmitters, also developed by the Bureau, to furnish a positive indication of the location of radio range stations is a major part of the program.

A further phase of the improvement plan provides for the equipment of all major radio stations now having the loop type antennas, with vertical radiator antennas which improve the transmission of directional signals to airmen and also are necessary for simultaneous transmission.

In addition, several intermediate landing fields will be enlarged, improved, or relocated, and lights on sections of four airways will be relocated in order to provide straight line courses.





A list of projects so far approved under the 1938 fiscal year program follows:

Radio

New full powered simultaneous weather broadcast and radio range stations will be established at Brownsville, Tex.; Delta, Utah; and Bloomington, Ill.

Medium powered stations having somewhat less coverage, but equipped for simultaneous transmission of radio range signals and voice communications from a five-tower vertical radiator system, will be established at the following places:

Abilene, Tex.	Malad, Idaho
Anton Chico, N. Mex.	Meridian, Miss.
Baker, Oreg.	Montague, Calif.
Bakersfield, Calif.	Palmdale, Calif.
Belgrade, Mont.	Parco, Wyo.
Chehalis, Wash.	Peoria, Ill.
Columbus, N. Mex.	Roseburg, Oreg.
Corpus Christi, Tex.	Sacramento, Calif.
Dallas, Tex.	Savannah, Ga.
Denver, Colo.	Smith Grove, Ky.
Dubois, Idaho	South Bend, Ind.
Eugene, Oreg.	Tampa, Fla.
Florence, S. C.	Toledo, Ohio
Great Falls, Mont.	Waynoka, Okla.
Indio, Calif.	Wendover, Utah.
Kingston, Calif.	Whitehall, Mont.
Lansing, Mich.	

Full-powered stations now equipped with loop type antennas at the following points will be converted into the simultaneous transmission type with vertical antennas:

Alma, Ga.	Miami, Fla.
Atlanta, Ga.	Mobile, Ala.
Boise, Idaho	New Orleans, La.
Burley, Idaho	North Platte, Nebr.
Charleston, S. C.	Pueblo, Colo.
Chattanooga, Tenn.	Raleigh, N. C.
Chicago, Ill.	Richmond, Va.
Columbia, Mo.	San Antonio, Tex.
Columbus, Ohio	Greensboro, N. C.
Detroit, Mich.	San Diego, Calif.
Elmira, N. Y.	Spartanburg, S. C.
Goshen, Ind.	Spokane, Wash.
Indianapolis, Ind.	Titusville, Fla.
Jacksonville, Fla.	Washington, D. C.

The following stations will be relocated:

Moran, Kans., to Chanute, Kans.
Van Nuys, Calif., to Los Angeles, Calif.
Mount Shasta, Calif., to Red Bluff, Calif.

Stations at Medford, and Portland, Oreg., and Seattle, Wash., will be moved to new sites in the same locality.

The medium-powered stations having loop antennas at Martin's Creek, Pa., and Fontana, Calif., will be replaced by new stations at Allentown, Pa., and Riverside, Calif., respectively, and equipped with vertical antennas and the simultaneous transmission feature for voice communication and radio range. Medium-powered loop antenna stations at Camden, N. J.; Erie, Pa.; Idaho Falls, Idaho; Syracuse, N. Y.; and Tucumcari, N. Mex.; will also be converted to the simultaneous type.

New medium-powered stations of the loop antenna type will be established at:

Acomita, N. Mex.	Golva, N. Dak.
Charlotte, N. C.	Santa Ana, Calif.
Custer, Mont.	Tintic, Utah

At the following sites will be located low-powered radio localizers transmitting directive signals from loop antennas, which serve as localizing guides for airmen within a radius of approximately 15 miles:

Austin, Tex.	Mt. Shasta, Calif.
Chesterfield, Tenn.	Needles, Calif.
Dillon, Mont.	Pocatello, Idaho.
Galveston, Tex.	Rochester, N. Y.
Grand Rapid, Mich.	Springfield, Ill.
Grantsville, Utah.	Stampede Pass, Wash.
Joliet, Ill.	Tyler, Tex.
Laramie, Wyo.	Utica, N. Y.
Macon, Ga.	Vero Beach, Fla.
Mormon Mesa, Nev.	

Radio ranges now located at Archbold, Ohio, Butte, Mont., Cherokee, Wyo., Milford, Utah, and Tacoma, Wash., will be converted to radio localizers of low power.

Nondirective marker stations which serve to mark one particular point will be converted to low powered directive markers at Ardmore, Okla., Lafayette, Ind., Livermore, Calif., McCool, Ind., and Morse, Ill.

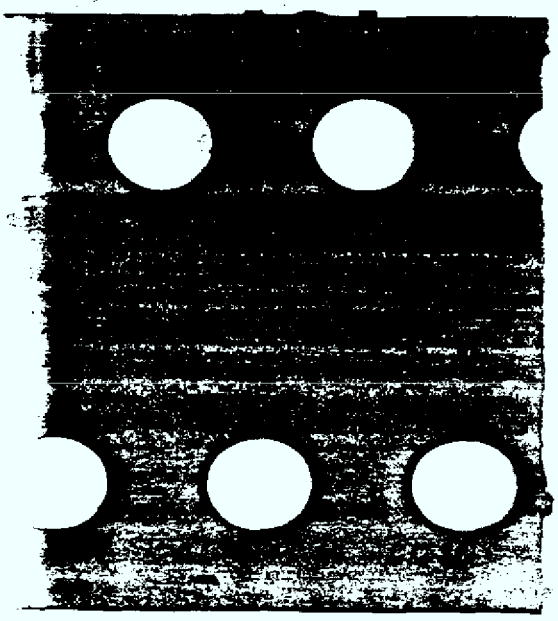
A fifth tower and radio telephone broadcast equipment will be installed at the following vertical antenna stations not now equipped for simultaneous voice transmission, and simultaneous operation will be provided:

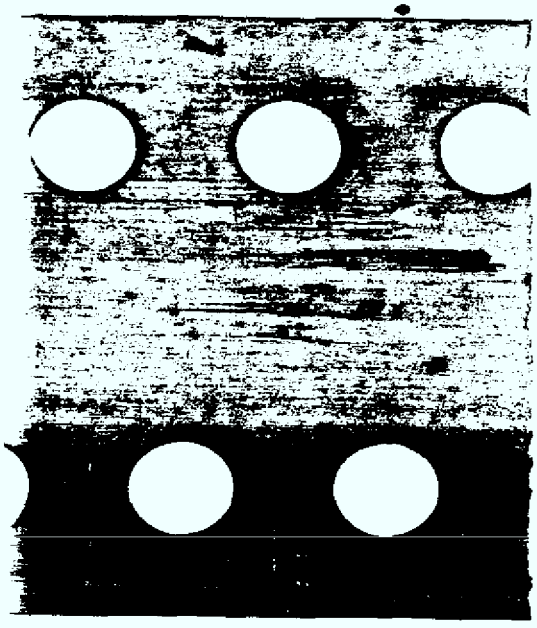
Burlington, Iowa.	Rockford, Ill.
Canadian, Tex.	Rodeo, N. Mex.
Daggett, Calif.	Texarkana, Ark.
Des Moines, Iowa.	Tucson, Ariz.
Milwaukee, Wis.	Wink, Tex.

Ultra high-frequency markers for airways traffic control use will be established as follows:

Chicago (Des Plaines), Ill., Lansing, Ill., Newhall Pass, Calif., Oceanside, Calif., Sandberg, Calif., Sandia Mountain (Albuquerque), N. Mex., Santa Fe Springs, Calif., Sheridan, Ill., and three will be constructed in the vicinity of Newark, N. J.

The medium powered radio range station now at Buckstown, Pa., will be relocated to Somerset, Pa., and reconstructed with a vertical tower antenna system. A station of the same type will be constructed at Martinsburg, Pa., and a low powered range will be established at Pittsburgh, Pa., for service as an airport localizer. This work will be a joint undertaking of the State of Pennsylvania and the Bureau of Air





Commerce, according to present arrangements.

All stations with vertical antennas, both new and old, are to be provided with simultaneous equipment and stand-by radio range transmitters for emergency use in case of a break-down, stand-by power, and positive cone of silence markers which give the airman a positive signal, either by turning on a light on his instrument board or by aural signal in his headphones, as he passes over the station.

Field and Lighting Changes

Field and lighting improvement projects, in some cases, call for the establishment of entirely new facilities, while others call for improvement, relocation, or discontinuance. These projects will be amended from time to time and others added to the list as the program progresses. Specific items now planned are:

New intermediate landing fields at East Liverpool, Ohio, and Marshall, Mo.; enlargement of fields at Advance, Mo., Archbold, Ohio, Chesterfield, Tenn., Pittsfield, Mass., and Saugus, Calif. Enlarge or relocate: Livermore, Calif., and Wendover, Utah; improve or relocate: Kylertown, Pa.; improve: Oceanside, Calif.; relocate: Columbiaville, N. Y.; discontinue: Higginsville, Mo.

Beacons between Dana and Laramie, Wyo., on the Salt Lake-Omaha airway will be relocated to provide a straight-line course. A new field will be established near McFadden, Wyo., and those at Dana and Medicine Bow will be discontinued.

On the Goffs-Needles, Calif., section of the Los Angeles-Amarillo airway the intermediate landing field now at Goffs will be discontinued and a new one established at Needles. One beacon on this section will also be relocated.

Field and lighting facilities on the Las Vegas, Nev.-Milford, Utah, section of the Los Angeles-Salt Lake airway will be relocated to a straight-line course.

The intermediate landing field at Baker, Calif., on the same airway will be discontinued and replaced by a new field between Baker and Riggs.

All facilities between Pasco and Spokane, Wash., will be discontinued with the exception of intermediate landing fields for day use at Connell and Sprague, Wash.

Field and lighting facilities will be relocated to a straight-line course between Pittsburgh and Harrisburg, Pa., and beacons between McConnellsburg and Harrisburg, Pa., will be discontinued. Field and lights between Washington, D. C., and Pittsburgh, Pa., will also be relocated to a straight-line course. These two projects, according to present arrangements, will be performed in conjunction with the State of Pennsylvania.

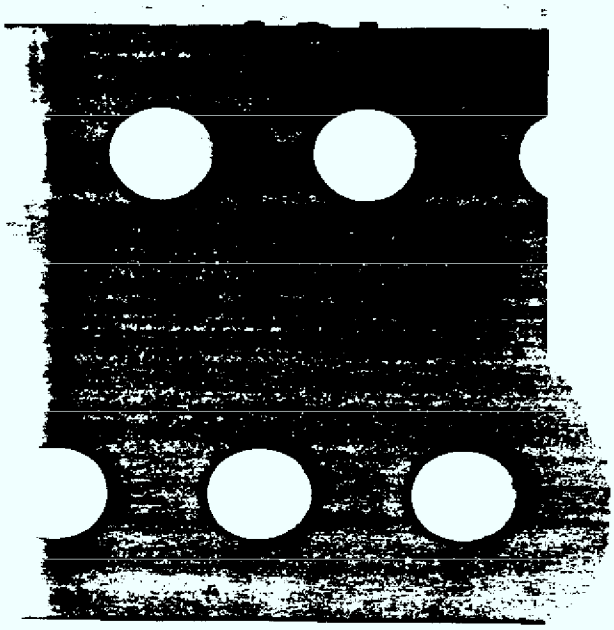
Teletypewriter Circuits

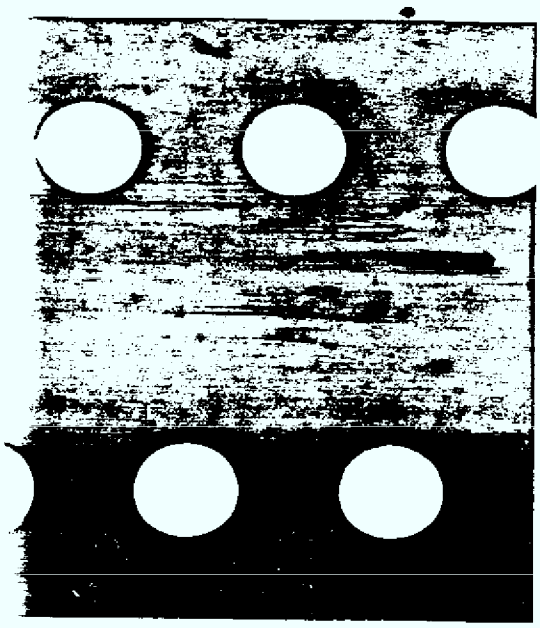
Besides accomplishing the construction work enumerated above, the Bureau will augment the service to airmen on the Federal System by arranging for about 7,500 miles of teletypewriter circuits for transmission of weather information. These include the following circuits:

Seattle-Vancouver.
Seattle-Fargo, N. Dak.
Fort Worth-Burbank
St. Louis-Tulsa.
St. Louis-New Orleans.
Great Falls, Mont.-Salt Lake City-Los Angeles.
Fort Worth-Houston.
Atlanta-Fort Worth.
Detroit-Grand Rapids.
Newark-Buffalo.
Washington-Nashville.
Washington-Cincinnati.
Atlanta-Jacksonville.

Report of Airship "Hindenburg" Accident Investigation

Contents





In an order dated May 7, 1937, made by the Secretary of Commerce pursuant to the Air Commerce Act of 1926, as amended, relating to the investigation of accidents in civil air navigation in the United States, South Trimble, Jr., solicitor, Maj. R. W. Schroeder, Assistant Director of the Bureau of Air Commerce, and Denis Mulligan, chief, Regulation and Enforcement Division of the Bureau of Air Commerce, all of the Department of Commerce, were designated to investigate the facts, conditions and circumstances of the accident involving the airship *Hindenburg*, which occurred on May 6, 1937, at the naval air station, Lakehurst, N. J., and to make a report thereon.

Commander C. E. Rosendahl, United States Navy, Col. C. de F. Chandler, United States Army, Col. Ruch B. Lincoln, United States Army, Col. Harold E. Hartney, technical adviser to the United States Senate Committee on Commerce, Hon. Gill Robb Wilson, director of aeronautics for the State of New Jersey, and Hon. Grover Loening, aeronautical adviser to the United States Maritime Commission, were designated as technical advisers. Gen.-lt. Friedrich von Boetticher, German military attaché, was selected by the German Ambassador at the invitation of the Secretary of Commerce, as an observer at the investigation.

On the fourth day of the hearings, the members of the German Commission appointed to investigate the accident, including Dr. Hugo Eckener, Lt. Col. Joachim Breithaupt, Prof. Guenther Bock, Prof. Dr. Max Dieckmann, Director Dr. Ludwig Duerr, and Staff Engineer Friedrich Hoffman, appeared and thereafter acted as observers and testified as witnesses. The United States Navy Board of Inquiry was represented throughout the hearing by an observer.

When the accident occurred, an aeronautical inspector of the Department of Commerce was present. Before midnight of the same day, other representatives of the Department reached the scene of the accident. After a preliminary inspection had been made, public hearings were held, from May 10 to May 28, in the main hangar at the naval air station, Lakehurst, N. J., in Asbury Park, N. J., and in New York City.

In addition to that provided by the Department's representatives, assistance was received from the United States Navy Department, Bureau of Investigation, Department of Justice, Weather Bureau, Department of Agriculture, National Bureau of Standards, Department of Commerce, New York City Police Department, and the Bureau of Explosives. Aviation companies, newspapermen, newsreel representatives, and photographers, many of whom were eye witnesses to the event, and others, furnished valuable information.

Part I.—Introduction

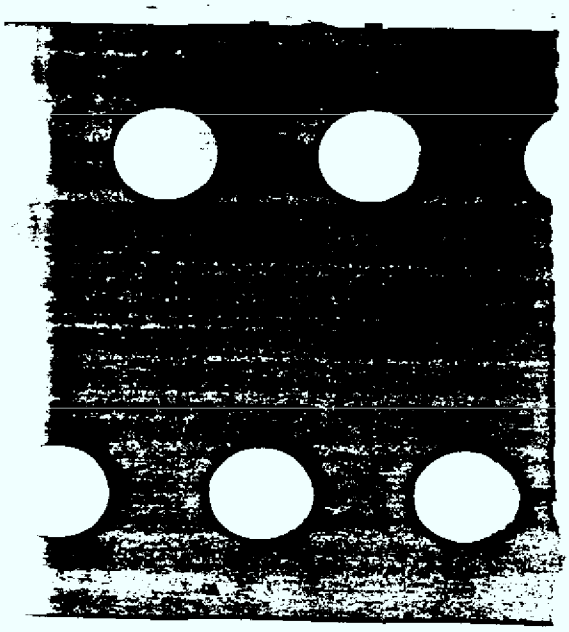
[NOTE.—All times reported herein, unless otherwise indicated, are eastern standard time (E. S. T.)]

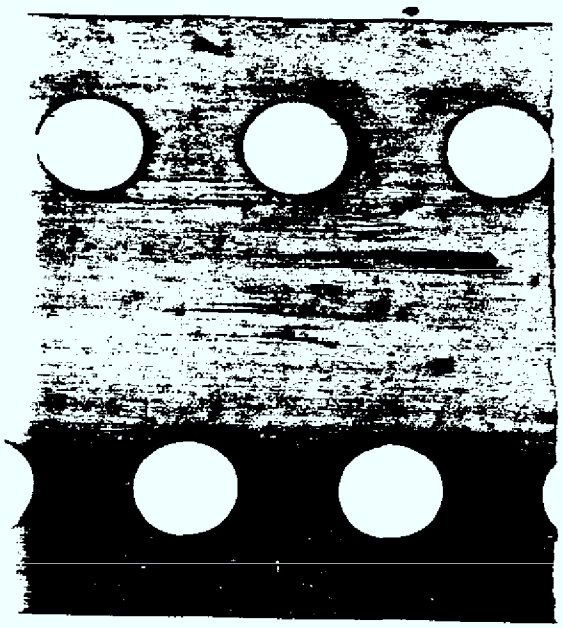
The airship *Hindenburg* was destroyed by fire at 6:25 p. m., E. S. T., May 6, 1937, at the naval air station, Lakehurst, N. J.

Schedule

The airship was completing its first scheduled demonstration flight for the 1937 season, between Frankfurt, Germany, and Lakehurst. It had departed from Frankfurt about 8:15 p. m., G. M. T., Monday, May 3, and was due at Lakehurst on the morning of Thursday, May 6. It was due out of

35





Lakehurst at 10 p. m., E. S. T. that night. Because of unfavorable winds encountered en route, its arrival at Lakehurst was deferred until 6 p. m., Thursday evening, and departure was to be postponed until midnight or later in order to reservice and prepare for the return voyage.

Ownership and Operation

The ship was owned and operated by the Deutsche Zeppelin Reederei, G. m. b. H., of Berlin, W. 8, under den Linden, Germany. The flight, which was to have been one of a series to be made into United States territory during 1937, was authorized by a provisional air navigation permit from the Secretary of Commerce, and a revocable permit issued by the Secretary of the Navy to the American Zeppelin Transport, Inc., of 354 Fourth Avenue, New York City, as general United States agent of the Deutsche Zeppelin Reederei, G. m. b. H., for the use of the landing field and facilities at the naval air station at Lakehurst.

Certificate of Airworthiness

In March 1937 the German Government renewed the airworthiness certification of the aircraft, reporting that all of its safety devices had been inspected and found satisfactory.

Crew

According to the crew list (see appendix I) furnished by the American Zeppelin Transport, Inc., the personnel on board, including officers, numbered 61, of whom 22 died as a result of the accident.

Passengers

The passenger list (see appendix II), likewise furnished, shows that 36 persons besides the crew were on board. Of these, 13 died as a result of the accident. Other passengers and members of the crew sustained serious injuries.

Goods Carried

Total weight of the freight carried was 325 pounds. The freight was stowed in the main freight compartment at frame 125; 2 dogs were kenneled at frame 92, and 3 packages were stowed in the control car. Mail was carried in a compartment on top of the control car. Of the freight and mail only a few pieces of mail were recovered.

Ground Crew and Facilities

The ground personnel consisted of 92 naval personnel and 139 civilians. Practically all of the ground crew had previous experience in landing airships. One member of the ground crew died as a result of burns received during the accident.

Flight Across the Atlantic

Across the Atlantic from Germany to the United States, the flight had been uneventful, save for retarding winds which were not unusually turbulent. The route traversed by the ship on this side of the ocean was from Nova Scotia, via Boston, Providence, Long Island Sound, New York, and thence to Lakehurst. After passing over Lakehurst the first time, it proceeded to cruise along the coast for a few hours before retracing its course from Tuckerton, N. J., to the naval air station.

Part II.—The Airship

Design and Construction

The airship was placed in service early in 1936. It bore builder's number LZ 129 and had been constructed by the Luft Schiffbau Zeppelin of Friedrichshafen, Germany, an organization which had previously built 118 Zeppelin-type airships. Briefly described, this type of design provides for a framework of duralumin metal girders with tension wires. There is division by frame wirings of the body into different compartments, into which the gas bags are placed to receive the lifting gas; a keel walkway to take certain loads; a framework with an outer cover of fabric to give form, and engine cars suspended from the frame outside the ship. The *Hindenburg* was a Zeppelin-type airship, having an axial corridor constructed longitudinally through the center of the hull.

1936 Record

During its 9 months of operation in 1936, this airship had made more than 55 flights; flown 2,764 hours, cruised 191,583 miles, crossed the ocean 34 times, carried 2,798 passengers and more than 377,000 pounds of mail and freight, all without mishap.

Dimension Capacities, Other Characteristics

Its length was about 803.8 feet; height, 147 feet; maximum diameter, 135 feet; fineness ratio (length over diameter), about 6; total gas volume, 7,063,000 cubic feet; normal volume, 6,710,000 cubic feet. Weight of ship with necessary equipment and fuel was 430,950 pounds; maximum fuel capacity, 143,650 pounds; total pay load, 41,990 pounds, and total lift (under standard conditions) was 472,940 pounds. Its rated cruising speed was about 75 statute miles per hour; its maximum speed was slightly over 84 miles per hour. Passenger space was entirely within the hull.

Controls

The control system was the conventional Zeppelin-type control, with two rudders acting as a unit for horizontal control, and two elevators acting likewise for vertical control. Emergency elevator and rudder-control wheels were installed in the stern of the ship. An electrical gyroscopic device attached to the forward rudder wheel provided automatic steering.

Outer Cover

The outer cover consisted of cotton fabric on certain parts of the frame; on others, linen, depending upon stresses to which it was exposed. The exterior surface of such fabric was treated with several coats of cellon and a mixture containing aluminum powder. As protection against ultraviolet rays, the inner surface of the fabric on the upper part of the ship was coated with red paint.

Gas Cells

In each of the 16 compartments of the ship was a gas cell containing the lifting gas, hydrogen. The middle cells were separate, whereas the two bow and the two

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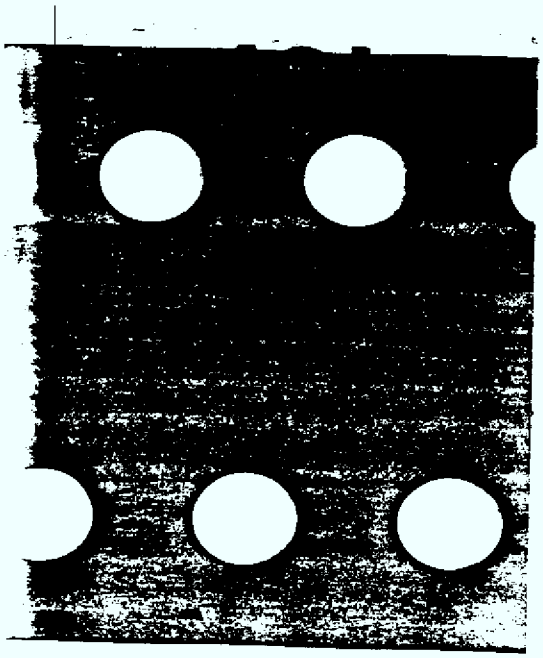
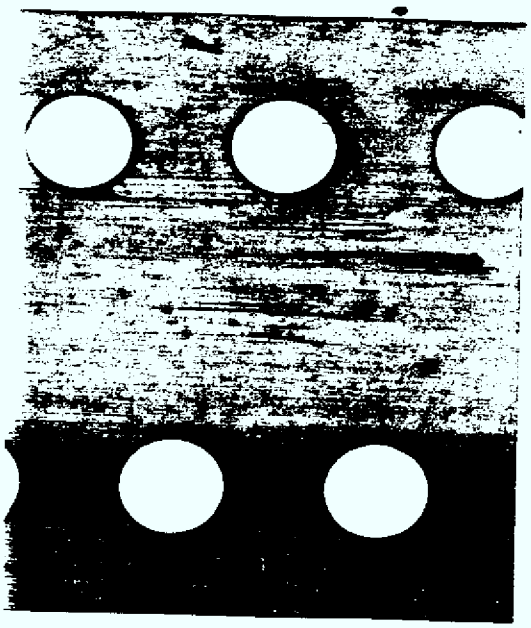




stern cells were intercommunicating. The gas cell material consisted of a film placed between two layers of fabric. Nettings were provided to prevent all sharp edges from damaging the gas cells. It was stated that the amount of gas leakage through this fabric approximated a maximum diffusion rate of about 1 liter per square meter per 24 hours.

Gas Valves

Fourteen automatic and an equal number of manually operated or maneuvering valves were affixed to the cells. A single maneuvering valve was affixed to cells numbered 1 and 2 and cells 15 and 16. Gas could be released from the cells by manual operation of the valve controls located in the control car, and hooked up with the valves by a series of wires and pulleys. This was done under the supervision of the captain or the watch officer in charge. The automatic or emergency valves were provided to reduce the pressure of the gas in the cells under certain circumstances. The cells were numbered from stern to bow, from 1 to 16. The maneuvering valves of cells nos. 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, and 14 were connected to a master wheel in the control car which operated all of them as a unit, and there also were independent controls for the separate maneuvering valves so that the gas in them could be released as desired.

Cell Fullness or Pressure Indicator

Electrically actuated gas fullness or pressure units were connected to the gas cells to indicate visually by sensitive meters in the control car the pressure and hence the relative fullness of the gas in the cells. These units were located in the ship's axial corridor, or walkway. The accuracy or sensitivity of this system was not definitely established. An appreciable amount of gas might have been able to escape before such escape would show on the visual indicator unless that indicator was kept under close observation. According to Witness Hugo Eckener, a cell could lose at least 200 to 800 cubic meters of gas before the indicator would show such a loss. Such an amount is only a very small proportion of a cell's content.

Gas Shafts

Between every two cells a gas shaft was provided into which gas could be valved directly from the cells. The shafts extended vertically from the lower walkway through the axial walkway to the top of the ship for ventilation purposes. On the top they came in contact with the outside air under the protection of specially designed gas hoods or ventilators.

Propulsion

Four Daimler Benz Diesel engines, type LOF–6, each having a maximum rating of 1,100 horsepower, were used to propel the airship. They were contained in four outside engine cars, or gondolas, and were suspended laterally on the ship's hull by struts. Engine-room telegraphs provided communication between the control room and the individual engine cars. The fuel used by the engines was a Diesel oil.

Propellers

The four-bladed propellers attached to each engine were of wood and 19 feet 9 inches in diameter. The blades were armored with brass sheathing about 1½ inches in width, on the leading edge, from about the 43-inch radius to the tip of the blade. The sheathing was bonded to the ship's structure through the engine. Tests were made with the prototype of the propellers used on the ship. They were tested to loads 50 percent in excess of the thrust to which the propellers would be subjected at take-off, which was three times greater than the thrust which would be imposed at cruising speed. They also successfully withstood the block tests. They were limited to 1,400 revolutions per minute in forward rotation and 1,120 revolutions per minute in reverse rotation. These revolutions were below the fluttering speeds of the blades.

Electrical Power Plant and Installations

The electrical power plant of the ship consisted of two 50-horsepower Diesel-driven generators with switchboards and distribution system. These generators were independent of the outside propelling engines. The electric generators and principal members of the system were located amidships on the port side of the keel. Current was generated for purposes of lighting, cooking, radio, and steering. There were two circuits, one of 220 volts, the other of 24 volts. The ship's electric wiring was of copper and was installed in accordance with the rigid regulations governing the German Mining Societies. The lead to the stern light, which was on a 220-volt circuit, using a very heavy cable protected by a special fuse, extended from the electrical power plant along the lower walkway and thence to the light. No electric wiring extended above the equator except in the extreme nose of the ship.

Ropes and Cables

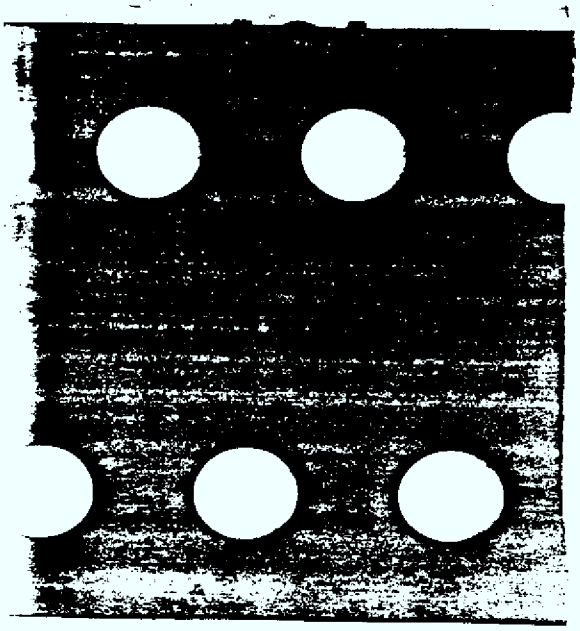
The main mooring steel cable was fixed to the tip or nose end of the ship. The port and starboard bow trail ropes were attached to the ship at frame 244.5. These trail ropes were about 413 feet in length. It is understood that in landing the ship, it was the practice to approach the ground mast from leeward and drop the wire cable and the two trail ropes. The main cable was then coupled to a mooring mast cable leading through the top of the mast. By means of a winch, the cable was then reeled in, pulling the mooring cone on the ship's nose into the corresponding cup on top of the mast. The trail ropes were coupled to ground ropes and led out to the sides to keep the ship headed into the wind and toward the mast and to prevent it from overriding the mast structure. In the stern, at frame 47, an after mooring cable was in practice let out through a metal fair lead. At frame 62, a port and starboard spider was let out at landing. Besides those enumerated, the ship was provided with other mooring or landing tackle, for such use as circumstances warranted.

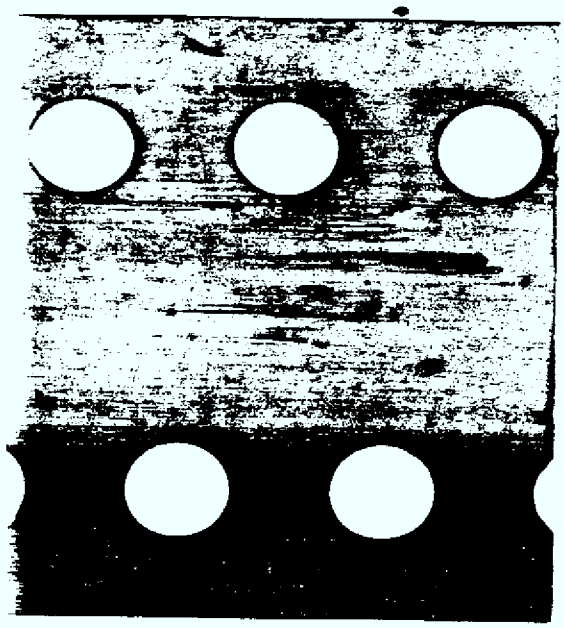
Ballast Arrangements

Water was generally used for ballast. The emergency ballast was contained in fabric containers, four of which, of 500 kilograms of water, were suspended in the bow and an equal number in the stern. To the right and left of the lower walkway were suspended a number of other ballast tanks, some of 2,500 liters each and others of 2,000 liters each. The ballast tanks could be emptied partially or totally by the elevator men by means of control wires connected to a ballast stand in the control room. Several of the fuel tanks could also be used for ballast purposes.

Radio Equipment

The radio room was located above the after end of the control car. Its equipment provided for two-way radio telephone and





telegraph communications. It included a short-wave and a long-wave transmitter, each with 200-watt antenna capacity; two all-wave receivers and two direction finders. The frequency of the short wave transmitter was 4160 to 17500 kilocycles. The frequency of the long wave transmitter was 120 to 500 kilocycles. The frequency range of the receivers was 12 to 20000 kilocycles. Power for the transmitters was obtained from a 220-volt direct current supply generated by the ship's electric power plant. The receivers obtained their high voltage from batteries, and power for their filaments was obtained through a series resistor from the 24-volt ship's generator. For the short wave transmitter, there was a trailing antenna of 26 meters length. For the long-wave transmitter, a trailing antenna of about 90 meters length was used. These trailing antennas were located directly below the transmitters and ran through an aperture in the keel of the ship. There was a fixed antenna extending from the control car about 15 meters toward the stern. The fixed antenna was used only for receiving purposes. In addition to this equipment, there was located in the bow an emergency transmitter and receiver, current for which was obtained from a generator driven by pedal power. This emergency set employed a trailing antenna about 20 meters in length.

Lifting Gas

The ship was inflated with hydrogen. According to the evidence adduced, this gas has the following characteristics: It is colorless, odorless, and tends to diffuse in all directions. The only way that hydrogen could be detected by smell would be due to the presence of impurities as a result of the process by which it was produced, or contamination from some source such as rubberized fabric. Hydrogen, for lifting purposes, has a density of approximately 5 pounds per 1,000 cubic feet, depending on the temperature and pressure. Its lifting power is the difference between the density of air and its own density. The density of air is about 75 pounds per 1,000 cubic feet. Assuming pure hydrogen, its lifting power would therefore be about 70 pounds per 1,000 cubic feet. An opinion was advanced that the general order of pressure of the gas within the cells of the ship was somewhere between half an inch and 1 inch of water pressure. It was stated that the density of hydrogen corresponds to air at a temperature of 5,000° F. and that the chimney effect of its escape through the gas shafts of the ship was so very great that there was no possibility of its moving down the shafts into the lower parts of the ship.

The flammable limits of a mixture of hydrogen and air are probably between 4.5 percent and 62 percent of hydrogen. Other experiments have shown variances from 8–9.8 percent to 66 percent. The temperature at which chemical activity between hydrogen and oxygen takes place is between 507° to 557° C. This temperature range is dependent upon the amount of hydrogen present. The range of activity of combustion will be from the lower limit of 4.5 percent at which there will probably be an invisible union without evidence of flame. A combustible mixture would be more hazardous in an atmospheric condition of 98 percent relative humidity, and temperature 60° F. than in dry air with relatively low humidity, since dry hydro-oxygen is more difficult to ignite and its ignition temperature is higher. In an explosion the flame propagates in all directions in the combustible range between 15 to 45 percent of hydrogen. These figures were arrived at experimentally with glass or metallic apparatus which did not have effect upon the combustion temperatures. Catalytic metals having adsorption properties would be likely to affect the combustion at lower temperatures. Finished duralumin would not be expected to have material catalytic effect upon hydrogen.

Bonding

The whole metallic structure of the craft was bonded.

Part III.—The Landing Maneuver

Meteorological Conditions

With respect to the meteorological conditions in which the landing was conducted, a summary of the general weather is given as well as the local conditions prevailing at Lakehurst at the time of the accident.

GENERAL

The 7:30 a. m., E. S. T. United States Weather Bureau map of the vicinity, including the northeastern tier of States, shows a disturbance over central New York and northeastern Pennsylvania, with a cold front extending from this center southwestward to West Virginia. This front separated neutralized polar air to the east of the cold front which had become warmer and more moist and neutralized colder air to the west of the front. The warmer and more moist mass of air covered the Middle Atlantic States, southeastern New York, and southern New England.

The cold front advanced eastward during the day from central Pennsylvania at a rate of 12 to 15 miles per hour, passing Lakehurst shortly after 3:30 p. m. There was not quite sufficient surface heating during the early afternoon to set off a thunderstorm at Lakehurst, and it was not until the front passed and some slight lifting of the air mass occurred that a thunderstorm began. The records of the naval air station show that the thunderstorm began at 3:40 p. m. and ended at 4:45 p. m.

Telegraphic reports indicate, the thunderstorms in and to the west of New Jersey were not severe; nor were they of a well-defined squall character. Between 12 p. m. and 1:30 p. m. E. S. T., these storms extended in a definite belt over the region of Harrisburg, Pa., northeastward to Bear Mountain, N. Y., and New Hackensack, N. Y. Between 1:30 and 2:40 p. m. none was reported. Between 2:40 and 3:40 p. m., Camden and Fort Monmouth, N. J., only, reported thunderstorms. Between 3:30 and 4:30 p. m., Lakehurst, Mitchel Field, N. Y., and Floyd Bennett Field, N. Y., reported them. Between 4:40 and 5:40 p. m. none was reported; and between 5:40 and 6:40 p. m., Floyd Bennett only reported one. Summarized, the thunderstorms in eastern New Jersey were of a local character and not severe.

The New York Weather Bureau office bulletin issued at 1:20 p. m., May 6, follows:

"1800 G. C. T. Moderate wind shift with increasing and lowering clouds possible thundershowers New York and vicinity expected in middle or late afternoon Stop New York scattered cumulus and small cumulo nimbus approaching from west—visibility excellent surface wind south 12 miles—barometer 29.68 falling steadily—temperature 66."

LOCAL

With the passage of the front at Lakehurst, the wind shifted to the northwest with gusts up to 20 knots, and was ac-

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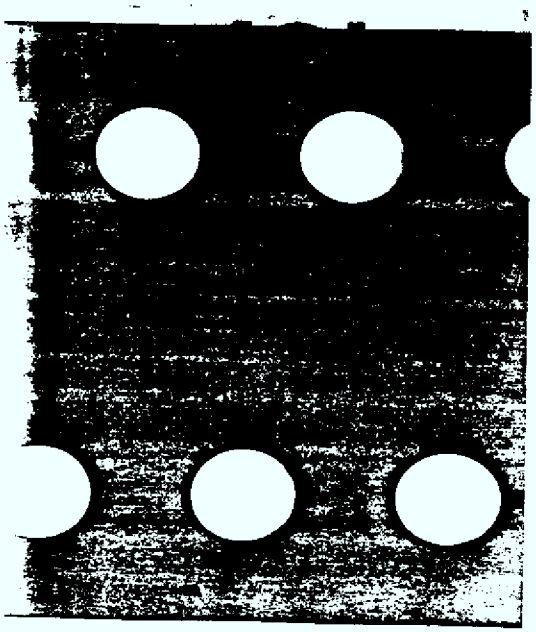
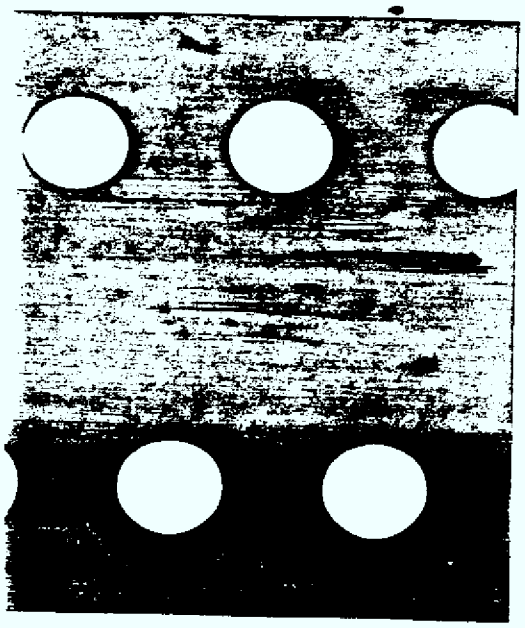




companied by slight increase in barometric pressure, decrease in temperature, heavy showers and several thundershowers. Then there followed a rapid decrease in the velocity of the wind and its direction became variable. The wind at Lakehurst at 6:10 p. m. went into the southeast and remained there for about 45 minutes, shifting again, and then it became mostly southerly. The front, after passing about 3:30 p. m. E. S. T., apparently slowed down to a rate of approximately 7 miles an hour and was in the vicinity of Atlantic City, N. J., at 8 p. m., its direction being north northeast-southwest, clearing rapidly after 8 p. m. During the afternoon cumulo nimbus and cumulus clouds developed locally and with the approach of the front there appeared a well-defined mild squall line in the west, which moved slowly over Lakehurst and apparently became stationary between it and the short line until about 5:30 p. m., when it continued eastward. Several heavy showers occurred between 5 and 6 p. m., with accompanying thunder. Visibility was reduced during these showers. At 5:12 p. m. the thunderstorm then over the field was moving north, and it was believed that by the time the ship arrived at the station the storm would have moved away from the station. The ship at this time was out of sight because of low visibility and the ceiling, in the direction from which it was expected to approach, was not more than 500 to 600 feet.

Conditions at the time of the approach were: Ceiling between 2,000 to 3,000 feet; clouds 0.7 stratus; very light rainfall; sky showed signs of clearing to the westward; barometric pressure 29.72; temperature 60° F.; relative humidity 98; surface wind light, variable and shifting and at the precise moment of the beginning of the landing was southeast 1 knot. It was expected that the surface wind direction would go into the west or perhaps the northwest. Reports from Trenton and Camden, N. J., indicated that the wind was westerly and that at Camden it was about 18 knots just previous to the landing of the ship. Wind at top of the weather tower on the field was west 6 knots. The approach level of the ship was about 200 feet above the ground. The top of the tower is 186 feet above sea level (ground elevation at place of landing was about 90 feet above sea level). The inversion condition was 60° at the lower level, 59° at the second, and 57° at the third level, being temperature readings at various levels from the top to the bottom of the weather tower. As the ship was approaching the landing area, occasional lightning was visible from the distant south and southwest, but none was observed over the field at this time. When the headway of the ship was stopped, a pronounced shift of wind was felt on top of the mooring mast, from southerly to southeast or south-southeast. This wind was colder than the previous wind had been.

Communications, Radio

Regular reports from the ship were received as scheduled at the naval air station, Lakehurst. At one stage in the latter part of the flight the static was bad but it did not prevent communications between the ship and ground stations. Shortly before arrival at Lakehurst, direct communication was maintained by the ship with the naval air station.

At 1:55 p. m., eastern standard time, the station received a message from the commander of the ship stating that he would depart from Lakehurst as soon as possible after arrival. At 4:42 p. m. the commander of the station radioed the ship: "Conditions still unsettled recommend delay landing until further word from station advise your decision." At 4:52 p. m., the commander of the ship replied: "We will wait till you report that landing conditions are better." At 5:12 p. m. the commander of the station advised the ship: "Conditions now considered suitable for landing ground crew is ready period thunder-storm over station ceiling 2,000 feet visibility 5 miles to westward surface temperature 60 surface wind west-southwest 8 knots gusts to 20 knots surface pressure 29.68." At 5:22 p. m. station commander radioed ship: "Recommend landing now." At 6 p. m. station transmitted to ship: "Overcast moderate rain diminishing lightning in west ceiling 2,000 feet improving visibility surface wind west-southwest 4 knots gusts under 10 knots surface temperature 61 pressure 29.70." At 6:08 p. m. station commander sent last message: "Conditions definitely improved recommend earliest possible landing." This was acknowledged by the ship.

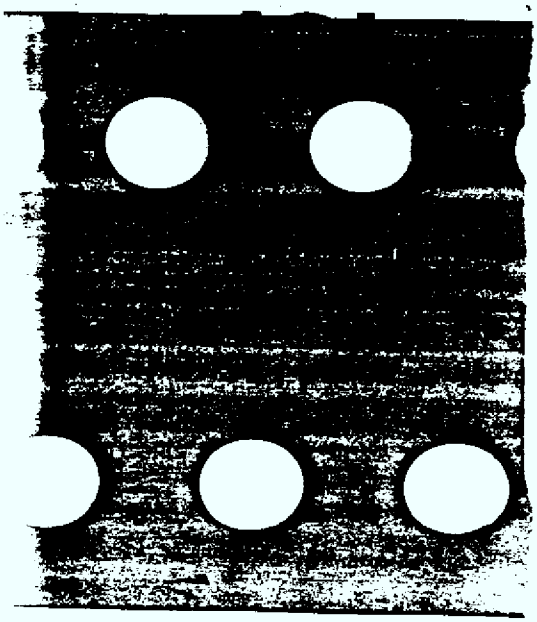
Prior to the accident all of the ship's trailing antennas had been reeled in. No high-frequency transmissions were being conducted when the trail ropes were dropped from the ship. Both transmitters were turned to the "off" position at that time and remained so thereafter. The radio dynamotors had also been shut off. The last message transmitted over the ship's radio was shortly after the landing station signal had been sounded, about 15 minutes before the fire. It was sent on the long-wave transmitter to Lakehurst at 6:10 p. m., E. S. T. During the landing, watch was kept on the long-wave receiver. No landing report was transmitted from the ship to Germany while it was over the field at Lakehurst. One of the ship's radiomen stated that atmospheric disturbances had been encountered during the afternoon of May 6, but that such condition improved toward evening and continued to improve during the last 30 minutes of the flight. No difficulty was experienced during that period in sending or receiving either on the short or long-wave transmitters or receivers. Witness Herbert Dowe, ship radio operator stated that he was on watch and actually listening to the radio until the fire started and that he did not notice any interference which could have been caused by improper bonding or shielding and that he did not receive any interference such as might have been transmitted by local station.

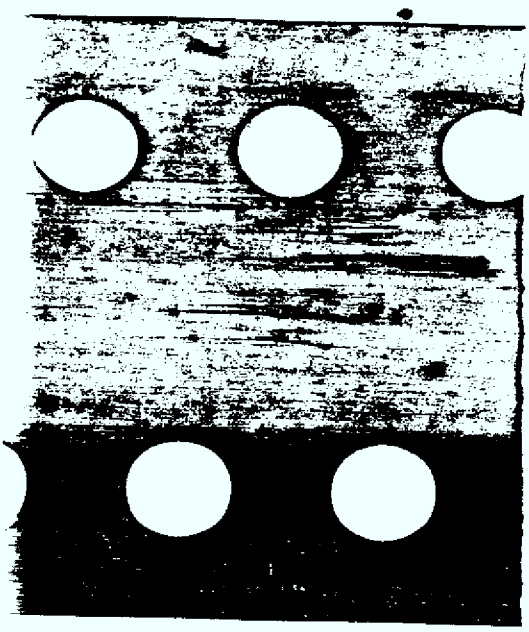
There was no oral communication between persons in the ship and on the ground during the maneuver.

The sequence of actions in bringing the ship up to the landing point is in part revealed pictorially by the track of the ship over Lakehurst, drawn on map of the naval air station, with notes on the maneuver by witness H. W. Bauer (see appendix III). Among other data the map provides information respecting successive altitudes, speed, operation of engines, release of ballast, and valving of gas.

Operation of Engines

About 10 minutes before dropping the bow trail ropes, the engines were running full cruising speed ahead; ship's speed about 33 meters per second (approximately 73 miles per hour). The altitude of the ship, according to its altimeter, was then about 180 meters (590 feet). About 8 to 9 minutes prior to the release of the ropes all engines were idled ahead; altitude 150 meters (492 feet); ship's speed falling off to 15 meters per second (approximately 33 miles per hour). Then, in fairly rapid order the after engines were idled astern and then put full astern to reduce the speed to 12 to 13 meters per second (approximately 27 miles per hour; after which all





engines were idled astern; altitude at this time was 120 meters (393 feet). About 2 minutes prior to dropping the bow trail ropes all engines were put full astern for a period of about 1 minute to stop the ship; after which the forward engines were idled ahead and the after engines were idled astern. When the trail ropes had been dropped the forward engines were given a short burst ahead; then idled ahead.

Release of Ballast

Starting at a point about three-quarters of a mile from the landing point 300 kilograms (661 pounds) of water ballast was dropped from ballast bag at frame 77. Then in rapid order, from the same frame, at about intervals of 1,000 feet, ballast was dropped twice again, the second time, 300 kilograms (661 pounds), the third, 500 kilograms (1,100 pounds). This release of 1,100 kilograms (2,420 pounds) of water ballast took place within a period of 2 to 3 minutes before the trail ropes were dropped.

Valving of Gas

According to witness H. W. Bauer's sketch, gas was valved on the wheel for 15 seconds approximately 10 minutes before dropping the bow trail ropes; ship proceeding at full cruising speed. About 8 minutes prior to dropping of ropes, gas in cells 11 to 16, first five forward cells, was valved for 15 seconds; ship then proceeding at 15 meters per second (approximately 35 miles per hour). Approximately 4 to 6 minutes before dropping the ropes, gas in cells 11 to 16, was again valved for 15 seconds; speed of ship 12 to 13 meters per second (approximately 27 miles per hour). About 2 minutes prior to dropping of ropes, gas in cells 11 to 16 was valved for 5 seconds.

Crew as Ballast

According to the elevator man who had taken over the elevator helm in the landing approach, the ship was still slightly tail heavy after dropping water and valving gas, consequently six men of the crew were sent forward to the bow in order to equalize the weights. He was unable to account for the tail heaviness of the ship after the ballast had been dropped.

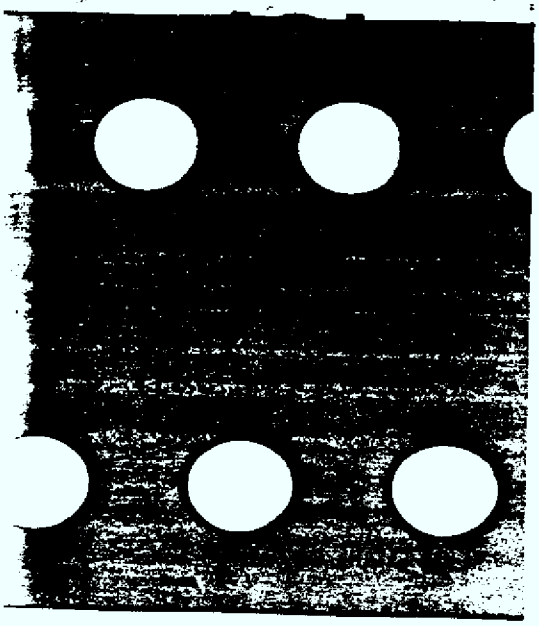
Tail Heaviness

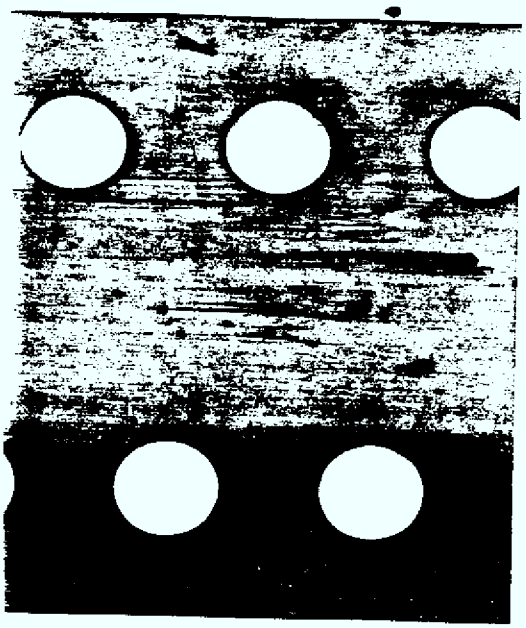
The ship was weighed off to the west of the field and was found a little light. There followed the trimming operations that have been described in the preceding paragraphs. There is evidence to show that the tail of the ship was heavy during the maneuver. Witness Albert Sammt, second in command of the ship, accounted for this condition by saying that it was due to the consumption of fuel; that it gave him no concern because it was very little. There was diversity of opinion advanced regarding this condition of the ship. Witnesses H. W. Bauer and C. E. Rosendahl considered it to be normal. The latter stated that the ship's tail heaviness had been logically accounted for, under the circumstances in which it landed in a light wind with little air flow on the tail surfaces and consequently little aerodynamic lift, 120 pounds midway from the tail of the ship would be felt by the elevator man and be noticed by those in the control car who were watching the inclinometer for that very thing; that the condition did not exist from the time of the dropping of the bow trail ropes during the 4 minutes intervening before the fire broke out.

To other witnesses the ship appeared heavy in the stern; among them witnesses Benjamin May, in charge on top of the mooring mast, and W. A. Buckley, assistant mooring officer. Witnesses Hugo Eckener indicated, according to his information, that while the ship may have remained in satisfactory trim from the time the trail ropes were dropped until it burned such interval was a short period of time. He did not think that a hydrogen leak would have been so large that in such a relatively short time it could have been noticed. He mentions the testimony of witness H. W. Bauer, relating to the trimming operations in which a very short time before the accident six men had been ordered forward. From this he infers that shortly before the ship reached the landing position it was necessary to trim ship by putting weight forward, and that the elevator man could hardly have noticed anything during this interval because the ship had no more forward speed. He further stated that careful calculation showed that the trimming moment effected by these operations amounted to at least 70,000 to 80,000 meter kilograms (506,391 to 578,933 foot-pounds) of trimming effect; when this effect is compared with the trimming moment that could be obtained aerodynamically at full cruising speed by the use of the elevator controls in the order of 150,000 to 200,000 meter kilograms (1,085,124 to 1,446,820 foot-pounds), then it became clear to him that the ship was very badly out of trim.

Witness Eckener also testified that witnesses in the control car had reported that the out-of-trim condition originated approximately one-half hour before the landing maneuver after going through the rain clouds; that the ship became tail heavy by running through heavy rain because the weight of the rain is greater in its effect on the horizontal fins, which are behind the center of gravity. There is also another apparent effect of rain upon the ship. That is the tail would seem to be heavy to the elevator man while the ship was running through rain, because it automatically has a tendency to nose up since the center of aerodynamic pressure moves aft. This effect, however, disappears very rapidly after passing through rain and in the present instance must have disappeared quickly because the ship as a whole was light. The ship, 10 minutes after passing through heavy rain clouds, should have again been in good trim. In the opinion of witness Eckener, however, it appeared so tail-heavy that it became necessary to apply a trimming effect of some 70,000 meter kilograms (506,391 foot-pounds). Furthermore, he indicated that if the ship had been as tail-heavy before it proceeded through the rain clouds, it would not have been operated without the release of ballast. As no testimony was given that ballast had been dropped before the ship moved into the rain clouds, witness Eckener believed that some unusual condition in the ship might have developed prior to the ship's landing.

With regard to the amount of rain that the ship had been exposed to during the landing maneuver, there appears to be some difference of opinion. Witness Sammt stated that there was a little rain as the ship crossed the field at the beginning of the maneuver, not heavy enough to weight the ship down as much as 500 kilograms (1,100 pounds); that was the only rain experienced during the last 2 hours of the flight because they had avoided the rain carried in the weather front. As the ship took a final bearing on the field it made a wide turn into quiet weather, returning to the field in this condition. According to him, the front had passed and the weather was favorable for landing. The sky was overcast but without





disturbances or squalls. Witness Nelson Morris, a passenger, stated that a very light rain fell exactly as the ship came over the field the last time, but until that time there had been no rain. Witness Anton Wittemann, who had commanded the airship *Graf Zeppelin*, stated that when the *Hindenburg* approached for its landing maneuver and as it passed through the front, the weather conditions as seen from the ship were entirely favorable; the thunderstorm had passed into ordinary rain. The ship entered somewhat heavy rain which became much lighter when closing in on the station. At the approach there were no cumulus clouds; there was a clear-cut stratus layer from which light rain was falling. Witness H. W. Bauer, second watch officer of the ship, said that about 20 minutes before the landing approach the ship passed through a heavy rain and through stratus clouds containing rain before making the approach. It did not pass near any lightning.

Altitudes at Landing

When the ship was brought to a stop over the landing point, its altitude was about 180 feet above the ground. It rose to about 200 feet when the bow port landing ropes checked its further upward rise. Thereafter, it descended to about 135 to 150 feet when the accident happened.

Electric Installations

According to Witness Philipp Lenz, chief electrician of the ship, no fuses blew nor did any circuit breakers operate just prior to the fire. The several circuits of the ship were intact, the interior ship lights and the navigation lights were burning as usual.

Rudder

Two witnesses testified that the top and bottom rudder did not appear to be working in unison when the ship came over the field. From other testimony it appears that the rudders were functioning normally.

Part IV.—The Fire

Ground Log

It was the practice at the naval air station to maintain a log of events in connection with the landing of the *Hindenburg*. The log of its last landing reveals that the first approach of the ship in landing maneuver was sighted at 6:15 p. m., E. S. T., May 6, approximately over the officers' quarters on the station. At 6:21 p. m., the bow trail ropes were dropped, on a bearing of 30° from the mooring mast, first, the starboard rope, followed immediately by the port rope. Ship was first observed afire at 6:25 p. m.

Description of Landing

The landing made on this occasion has been described as a high landing or flying mooring, a method of landing which is occasionally employed. Some qualified witnesses stated that it was normally conducted in every respect. Among these were Witnesses Rosendahl and A. F. Heineu. Others indicated that the approach seemed hurried; that the ship made what seemed to be a fairly short turn and approached the mooring circle fairly rapidly. Based upon the statements of other witnesses, Witness Eckener expressed the view that the ship must have proceeded in a sharp turn to approach for its landing. Witness Sammt said the turns were normal.

Incidents Before the Fire

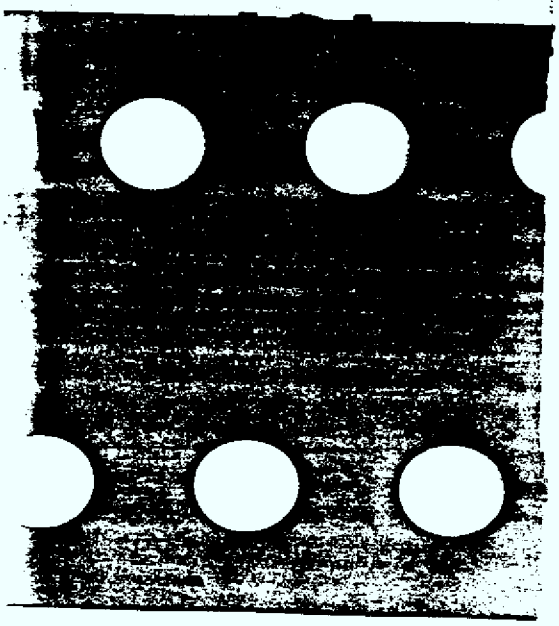
Before the fire broke out, the ship was being held by the bow port trail rope which had been coupled to the port yaw line and a strain had been taken on this rope around the niggerhead of the ground winch. The bow starboard trail rope had not been coupled to the ground line, but was being handled by the starboard bow landing party. At no time during the approach did the ship come closer to the mooring mast than 700 feet. The main bow cable of the ship at this time had been let out about 50 feet, but neither it nor any of the cables or ropes in the stern had reached the ground before the fire started. After the trail ropes in the bow had been dropped, the ship no longer had any forward speed. It began to move up and astern and also to swing slowly to starboard. Then a light gust was felt from port.

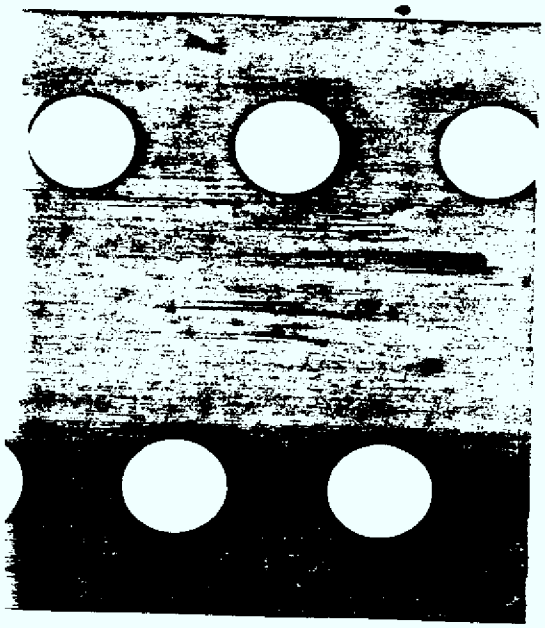
Fluttering of Outer Cover

Witness R. H. Ward, in charge of the port bow landing party, a couple of seconds before the fire, had his attention attracted by a noticeable fluttering of the outer cover on the top port side between frames 62 and 77, which includes cell no. 5. No smoke or other disturbance accompanied the flutter when he first saw it. It was a wave motion. In his opinion the motion of the surface was not due to the slip stream or resonance effect of the propeller. It was entirely too high from the propeller. It appeared to him to be more like an action of gas inside pushing up, as if gas was escaping. He apparently had seen this action occur in other aircraft. The ship had no perceptible forward motion the time he observed the flutter; its engines were idling in forward rotation. The fabric had not opened up when he first made the observation. The flutter was followed by a ball of flame approximately 10 feet or so in diameter; then came an explosion. On a diagram this witness indicated that the first appearance of fire was near the top of the ship and above the point where he saw the flutter. With respect to this testimony, witness Eckener said that a leak in a gas cell, permitting the escape of 40 to 50 cubic meters of gas per second, would be sufficient to cause a flutter in the outer cover which could be observed as reported, but probably would not be enough to draw the attention of those in the control car to a loss of buoyancy aft. Witness R. W. Antrim, who was on top of the mooring mast, also stated he saw that the fabric behind the after port engine was very loose and fluttering. It extended rearward and upward from the after port engine to a quarter of the way to the tail.

Strain on Port Trail Rope

The drift of the ship to starboard, according to the mooring officer, witness Tyler, was finally checked by means of the port trail rope. This rope was hauled up taut on the winch. The starboard trail rope was being handled by the manpower of the starboard bow party. Witness Albert Stoeffer, one of the ship's cooks, who was looking down from a window in the ship, stated that he "saw how the landing crew came running up, and how they loosened the knot of that rope and fastened it to the lower lines on the ground. Then I saw how the ropes took tension and at the moment I felt a very strong detonation of the ship, vibration of the ship. * * * I did not notice any explosion. I only noticed that vibration I was speaking about before." He thought the ship was striking the mooring mast.





Witness H. W. Bauer stated that after the landing rope had been fastened, he went from his position to the port window in the control car and observed the tensioning of the landing ropes. At the time of that observation, there was a strong shock in the control car and his first assumption was that the landing rope had broken. Witness Max Zabel, ship's third officer, stated that he observed the bow trail ropes being dropped; that the port trail rope became rather tight. He saw the ends of the ropes which were tied together whirl around and tighten. Immediately after this landing rope had become tight, an explosion was heard and the destruction of the ship occurred. He described the vibration that was felt in the control car as an extraordinary one. Witness Dowe, ship radioman, testified that while watching one of the landing ropes being handled by the ground crew there suddenly was some tearing in the ship, a metallic tearing. A passenger reported, "and then as that rope was getting taut, I heard a detonation * * *."

Sensations Within the Ship

In describing their nervous reactions at the beginning of the accident, some of the persons within the ship, in addition to such descriptions as are provided in the preceding paragraph, spoke, in effect, as follows: Witness Severin Klein—When the ship was almost standing still, it gave a sudden jolt. Witness Xavier Maier—First he heard detonation; then he noticed the vibration, the shock, and fell on his back. Witness Heinrich Kubis—First heard or felt an explosion approximately at the same time that the ship took a sharp inclination. Witness Lenz—The sound that he heard he thought might have been a landing rope breaking. Witness Claus Hinkelbein—The jerk and the sound of the detonation and the sight of the fire or the reflection of fire were all simultaneous. Witness Kurt Bauer—Noticed a cracking shock which originated in the rear. Witness Wittemann—When he heard dull detonation, thud, his first idea was that rope had parted. Witness Walter Ziegler—Saw how the port landing rope was hauled tight; shortly thereafter he heard a dull thud or detonation and a heavy shock went through the ship. Witness Kurt Schoenherr—It was a strong shock he sensed after hearing a rather dull detonation. Witness Sammt—His first intimation that something was out of order was a heavy push, about the same shock as if the ship had been pushed to the side and the landing rope had broken. Neither prior to nor after the push did he hear a muffled explosion. He did not associate the push with anything that might have occurred in the after part of the ship.

Appearance of Fire

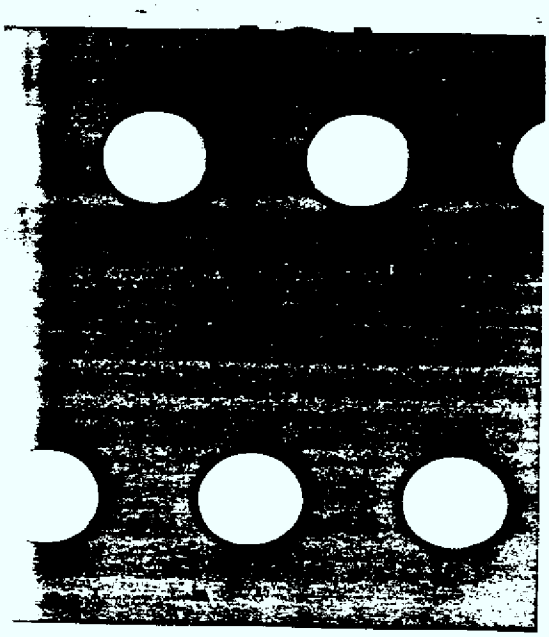
Numerous expert and lay witnesses on the field testified as to where they first observed the fire on the ship. There was great diversity in this testimony for reasons that are very apparent. Among the most important of these reasons were the extreme rapidity with which the fire spread, the different positions of the witnesses with respect to the ship, the size of the ship, more than one-sixth of a mile in length, and an over-all height equivalent to a 12-story building, and the fact that at the time of the fire it was still daylight. It is estimated that the interval between the first glimpse of flame and the impact of the main body of the ship with the ground was 32 seconds. The great majority of the ground witnesses who testified as to the first appearance of fire were looking at the port side of the ship.

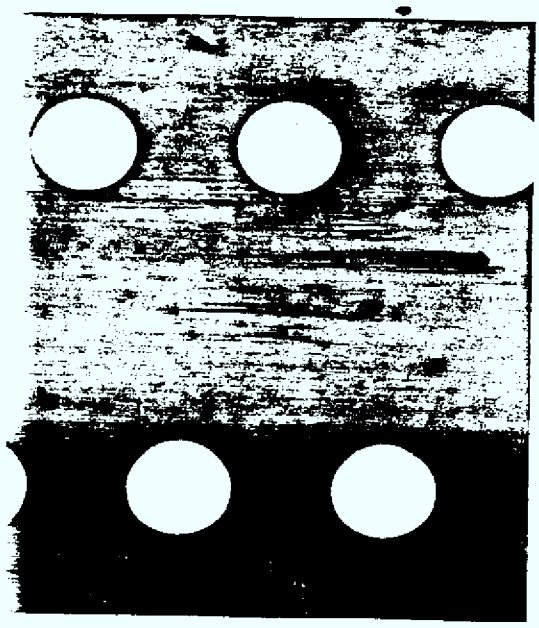
After carefully weighing the oral evidence and transcribing to a master diagram the numerous diagrams on which the ground witnesses indicated their first observations of fire, we conclude that the first open flame, produced by the burning of the ship's hydrogen, appeared on the top of the ship forward of the entering edge of the vertical fin over cells 4 and 5. The first open flame that was seen at that place was followed after a very brief interval by a burst of flaming hydrogen between the equator and the top of the ship. The fire spread in all directions, moving progressively forward at high velocity with a succession of mild explosions. As the stern quarter became enveloped, the ship lost buoyancy and cracked at about one-quarter of the distance from the rear end. The forward part assumed a bow-up attitude, the rear appearing to remain level. At the same time the ship was settling to the ground at a moderate rate of descent. Whereas, there was a definite detonation after flame was first observed on the ship, we believe that the phenomenon was initially a rapid burning or combustion—not an explosion. From the observations made, it appears that there was a quantity of free hydrogen present in the after part of the ship when the fire originated.

A brief résumé of the observations made within the stern of the ship shows that witness Helmut Lau, who was standing on the ladder leading up to the lower catwalk from the lower vertical fin and was looking up facing the port side of the fin, heard above him a muffled detonation and saw from the starboard side, down inside the gas cell, a bright reflection on the front bulkhead of cell no. 4. He saw no fire at first, but a bright reflection through and inside the cell. The cell suddenly disappeared because of the heat. Then cells 3 and 5 caught fire. This witness said he did not see the center of the origin of the fire, but it must have been farther up since he saw the reflection of fire through the cell wall material. It was the same type of explosion that one hears when using a kitchen gas range, when first lighting the flame or turning it off. Witness Lau did not smell any hydrogen at the time he made these observations. Witness Hans Freund was letting out the after mooring cable at frame 47 and had let out a few meters of it when he heard a muffled detonation. Fire was simultaneous with the explosion. He was surrounded by fire immediately. Witness Rudolph Sauter, who was stationed in the keel of the lower vertical fin, first heard a dull detonation, then saw fire in cell no. 4, a big fire, which he identified as a hydrogen fire. None of these witnesses in the stern of the ship felt any unusual vibration or heard any breaking of structures prior to the detonation or the sight of fire or reflection of fire. None of the other members of the crew or passengers on board the ship observed fire or reflection of fire until after feeling an unusual vibration or shock or hearing the detonation.

Part V.—The Combustible Mixture and Its Ignition

Having retraced the course of events and the circumstances surrounding the accident, we come to the question, why did the fire occur? As yet, with the few exceptions to be noted, no more has been provided than a hypothetical approach to the answer. We have weighed the several theories that have been advanced.





Sabotage

The possibility that the cause is to be explained by premediated or willful act has received active attention. Sabotage has been examined under two classifications: the first—external, including the use of incendiary bullet, high-powered electric ray, and the dropping of an igniting composition upon the ship from an airplane; the second classification—internal—including the placing within the ship of a bomb or other infernal device. To date, there is no evidence to indicate that sabotage produced the grim result.

Accidental Causes

In a consideration of accidental causes, two factors must be found together. There must be present (*a*) a combustible mixture of hydrogen and oxygen of the air; and (*b*) sufficient heat to ignite such mixture. In the analysis of the evidence the mixture and its ignition are treated separately.

PRESENCE OF COMBUSTIBLE MIXTURE OF HYDROGEN AND AIR

Accumulation Through Diffusion or Osmosis

While it is conceded that the fabric of which the cells were made is slightly permeable to the diffusion of the contained hydrogen, it is not our opinion that this characteristic of the cell walls, under the circumstances prevailing, would account for a combustible accumulation of gas and air within the ship; the normal rate of seepage being, as was indicated under description of the cells, about 1 liter per square meter per 24 hours.

FAILURE OF VALVE MECHANISM

According to the testimony, only one valve failure had occurred on the ship. This happened when the ship was new; as a consequence, certain changes had been made in the construction of the mechanism. In any event, the failure noted occurred to an automatic or pressure relief valve which would not have been functioning at the time of this accident. However, because the valves were mechanical devices, it was possible that there might have been a defect or failure in them, but no testimony appears to show that this possibility was a likely one.

DECREASED VENTILATION

Another query regarding the presence of such mixture presented itself. Could it have been due to the reduced scavenging of the gas by the ship's ventilation system during the last minutes of the craft's existence when its speed eventually had been reduced to a full stop, combined with the last valving operation, about 6 minutes before the fire? This theory seems improbable because of what was said about the efficiency of the ventilation system and because of the fact that the chimney effect created by the 6-knot wind that was blowing at the ship's elevation during the last 4 minutes prior to the fire should have evacuated practically all of the gas from the shafts. The forward speed of the ship, reported to have been from 15 to 20 knots per hour, when the last valving operation was performed, should have been ample, it was stated, to have cleared the gas rapidly from the ship. A further argument made with regard to the scavenging of gas was that immediately after the last reported valving the ship's engines were backed down hard, and that t is deceleration should have tended to move the gas in the ship toward the bow and out through the forward gas shafts.

In considering the production of such mixture by the rupture of a cell or cells, there are at least several avenues to explore.

ENTRY OF PIECE OF PROPELLER

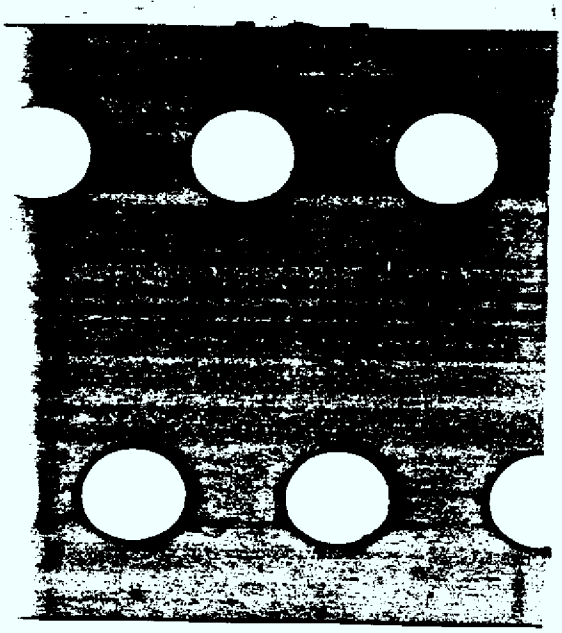
One of these might be laid to the failure of a propeller and the throwing of one of its fragments through the adjacent part of the hull into a cell. To this possibility there was devoted an extensive examination by experts of our staff and those of other agencies. The condition of the propeller of engine car no. 2 attracted our attention. Witness F. W. Caldwell, one of this country's foremost propeller experts, was quite certain that the propeller of the after port engine did not break in flight but was shattered at the time the car struck the ground. He said that there was no indication of the separation of the sheathing from the blades except as the result of shattering on impact. Witness Deutsche, machinist in the after port engine car, indicated that the propeller of his car was still rotating when it struck the ground; that he did not feel any unusual vibration of the engine before the crash.

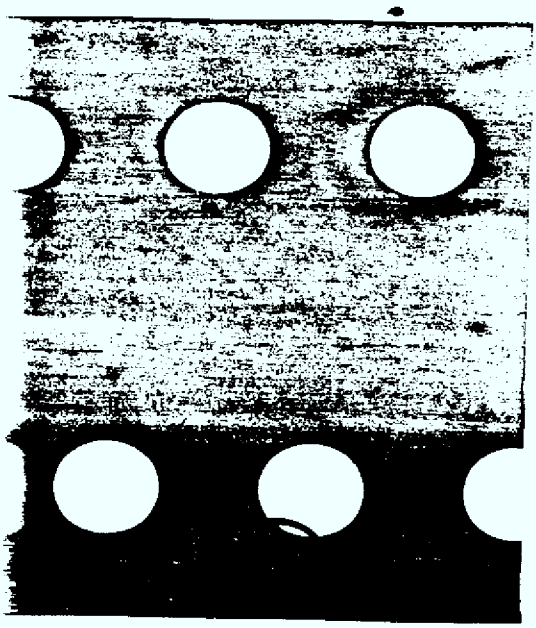
FRACTURE OF HULL WIRE

One other significant possibility must be discussed while the question of cell rupture is being examined. It was suggested that, while in flight, a tension wire might have ripped a hole in a cell and thus permitted a quantity of gas to escape. Coupled to this possibility is the testimony of Witness R. H. Ward, digested briefly in the statement of facts, that he saw a fluttering in the outer cover above the equator between frames 62 and 77 and believed that this fluttering was caused by gas escaping into the space between the adjoining cell and the outer cover. A shear wire in one of the panels at the place from which the gas was escaping could have snapped while the ship was turning during the landing maneuver. Witness Eckener stated that such turns generate high stress in the after part of the ship, especially in the center section close to the stabilizing fins which are braced by shear wires. The gas thus accumulated between the cells and the outer cover must have been a rich mixture. Such a mixture, enclosed in a space between the outer cover and the gas cells, would, if ignited, burn with relatively slow speed until gas in greater volume was released by the burning through of the cell walls. Witness Rosendahl recalled that in the early years of operation with naval aircraft, shear wires had broken with varying effect, causing no serious damage, however.

MAJOR STRUCTURAL FAILURE

Consideration has been given to the possibility that a major structural failure in the stern of the ship caused the hydrogen to be liberated by rupturing a cell and forcefully breaking an electric lead or metal part, thus producing a spark. The fire broke out when the port trail rope, which held the ship to the ground, became taut. It was reported by some persons that at, or about, the time they observed the fire they heard a cracking sound from the stern of the ship. An ex-





amination of the wreckage disclosed that the rivets, by which the after end of the axial corridor was connected, through a fitting to the hull, had pulled out; that all of the radial wires in the small frame nearest the stern had broken in tension; that only a few of the small tabs of metal from the periphery of the frame, which had been pulled off the bight formed where the radial wires hooked on to the frame, were found on the ground below where the frame struck. The shearing of the rivets and the condition of the wire and the frame might be explained by the force with which the rear end hit the ground; or by the torsional or other stresses which the tail suffered in its last moments in the air. It has also been pointed out that the ship was stressed for greater loads than the tensional strength of the bow trail rope, and that the rope had not parted. Furthermore, it was observed that the eye through which the trail rope was attached to the ship and the longitudinal member to which the eye was affixed, were intact after the accident. The four members of the crew in the stern of the ship testified that they did not hear or see any such structural failure prior to the fire.

IGNITION OF THE MIXTURE

Many of the theoretic aspects of the ignition of the combustible mixture were dealt with at great length by a number of experts. Only a summary of this phase of the investigation is related in this report.

MECHANICAL

If there had been enough heat generated by the friction of wires or other members of the ship coming forcibly into contact with each other, due to structural failure or breaking, a sufficiently hot spark might have been produced to set off such mixture. There is insufficient evidence to sustain a conclusion based upon this theory.

CHEMICAL

As has been stated, there are metals which have a catalytic effect upon a mixture of hydrogen and air and would materially lower its ordinary ignition temperature, but it does not appear that any such metal was in that part of the ship were the fire was first observed.

Under the title of chemical possibilities there has also been suggested that a flame might have been produced by spontaneous combustion. The evidence is inadequate to support this theory.

THERMODYNAMIC

In the examination of thermodynamic possibilities much time at the outset of the investigation was given to the possibility of such mixture being ignited by the sparks from the engine exhausts. It was suggested that sparks or larger particles of carbon thrown out from the Diesel engines might have been carried into the openings in the lower part of the hull or have been blown over the exterior of the stern and there have ignited such mixture. While the circulation of the exhaust gases, set up by the direction of rotation of the propellers just before the accident (the after engines idling in reverse and the forward engines idling ahead) was different from that produced while under way, it was maintained by the German experts that this circumstance would not result in sparks or carbon particles reaching the interior of the hull, and, furthermore, that the sparks would not have been able to ignite such mixture on the top of the ship at least 165 feet away from the after exhaust outlets. Witness Ludwig Duerr testified that very extensive experiments respecting this possibility had been conducted by the builders and the results had been reassuring. When the engines are delivering 1,100 to 1,200 horsepower the temperature leaving the piston before it enters the exhaust stack is 500° to 530° C. The temperature of the exhaust is lower. The engines ordinarily develop 800 to 850 horsepower. At this output the temperature of the exhaust gases is 450° to 480° back of the cylinder. With a mixture of air sucked in, the temperature is reduced to 230° to 250° C. Visible sparks have a temperature over 500° C. but lose their heat rapidly as they are impelled through the air.

Had this been the cause of the ignition, it is believed that it would have come into play before the elapse of the 4-minute interval between the dropping of the trail ropes and the accident.

That the heat of the exhaust gases caused the havoc is also improbable. If ignition had happened at the exhaust it would have been necessary that the temperature of the band of air between the outlets and the place of the first flame would have had to be about 507° C. According to witness Duerr, the temperature at the exhaust outlets was much lower than 507° C. With the *Hindenburg* and the *Graf Zeppelin*, no difficulties had been experienced from this quarter.

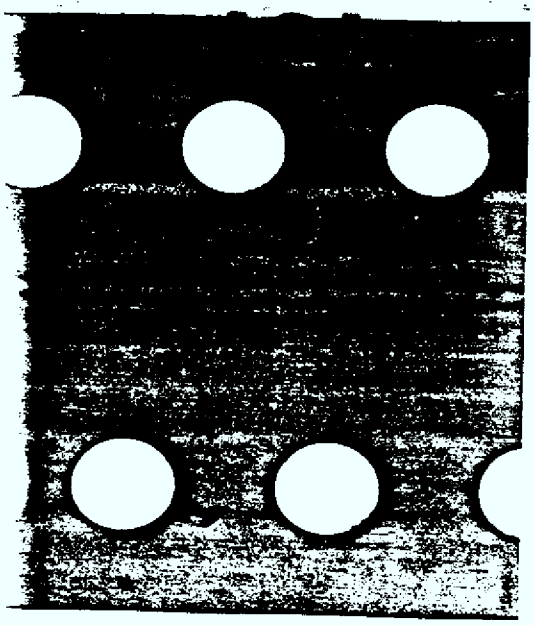
ELECTRICAL

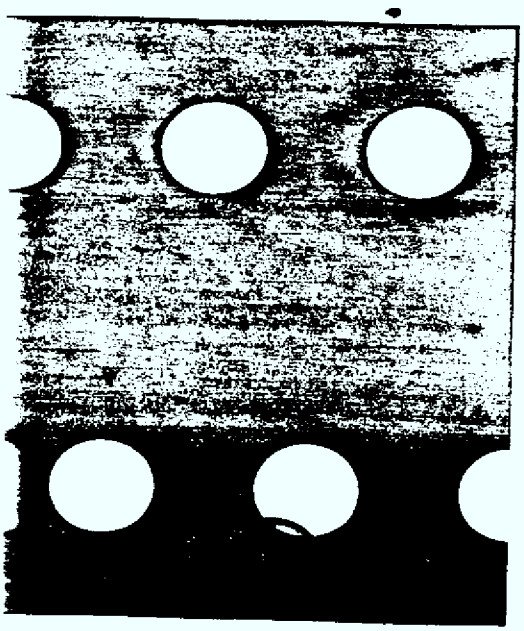
Under the classification of electrical sources of ignition several were considered. A combustible mixture of air and hydrogen could have been ignited by the overheating of wires carrying current within the ship, e. g., by a short circuit. Barring the possibility previously alluded to, of a substantial failure in the stern structure of the ship, which might have produced a sudden breaking of such wires in the aft end of the ship, it is thought to have been only remotely possible that the mixture was fired by a defect or failure of the ship's electrical wiring.

According to witness Lenz, who was stationed in the electrical power plant at the time of the accident and had most of the ship's electric indicators, fuses, and circuit breakers under observation, the various circuits were functioning normally just prior to the conflagration. No fuse blew or circuit-breakers operated at that time. It was also observed that the cable carrying the current to the stern light was very sturdy and was installed so as to provide plenty of slack to compensate for expansion and contraction of the frame of the ship.

SPARK IN GAS FULLNESS OR PRESSURE INDICATOR

A theory introduced by witness Heinen was that the cause of the fire was due to the ignition of such mixture in one of the gas fullness or pressure electric meter actuating units fixed to the axial corridor in the vicinity of cells nos. 4 and 5. He believed that a small pocket of gas accumulated in the folds or ridges of the cells surrounding the corridor and found its way into the inner recesses of the meter and was there ignited by an electric spark; that the fire thus created traveled up along the radial wires to the space between the cells and the outer cover igniting the free hydrogen collected along the longitudinals at the top of the ship on the inner surface of the outer cover; that the relatively slow burning of such free hydrogen would account for the peculiar manifestations of illumination described by certain witnesses; that the fire in the second sequence then destroyed gas cell no. 4, as seen by witness Lau.





With regard to the presence of gas in one of the meters it was estimated that in 1 hour the seepage in the axial corridor would have amounted to one-fortieth of 1 percent of the volume of the corridor; that even in the motionless condition of the ship, the corridor would have been well ventilated due to the chimney effect created by a wind of 6 knots blowing over the gas shafts; that the ventilation in the corridor would have prevented pockets of hydrogen from forming because the air current through the corridor was not laminated but was made up of whirls and eddies. However, if it could be shown that a rent occurred in a cell below the axial corridor, then it is possible that some free hydrogen might have found its way into one of the meters.

In regard to the ignition of such mixture within a gas pressure, or fullness meter the following is quoted from a report of the Bureau of Standards, relating to exhibit 74, one of the meters taken from the ship:

"It is evidently intended for measuring and giving a remote indication of small gas pressures by electrical means. The gas pressure acts on a diaphragm in opposition to a helical spring. A plunger attached to the diaphragm carries a coil of wire which has a resistance of 100 ohms. Two rollers, connected in parallel, make contact with the sides of the coil. Two flexible connections run to the ends of the coil. The change in the relative resistances of the two parts of the circuit between the contact rollers and the ends can cause suitable electrical indicating instruments in the control cabin to indicate the position of the coil and diaphragm and hence the pressure.

"All electrical parts are enclosed in a cylindrical metal box. The only openings into this box are (1) the hole, 10 mm in diameter at the top through which the operating rod passes with a clearance of not over 0.05 mm and (2) the opening at the bottom which is completely filled by the 3-conductor cable (covered with metallic braid) which connects to the rest of the circuit. The conical housing surrounding the metal box is well ventilated.

"The device seems to be excellently designed and constructed from the standpoint of safety, and there appears no way by which it could with any reasonable probability have caused a fire.

"An overheating of the device by short circuit seems impossible. A short circuit external to the device would impose on it only the full voltage (24 volts) of the circuit and produce a rate of heat dissipation of less than 6 watts. A short circuit inside the device would not draw more than the 1 milliampere fixed by the external instruments. A simultaneous short circuit both inside and out would blow a fuse, if one was present, before a dangerous temperature was reached. Good practice requires such fuses on all circuits, and one was probably used.

The normal operation of the device should produce no sparks. Deterioration of the contact rollers or of the coil, or a breaking of a wire inside the metal box might produce a spark inside. It seems impossible that hydrogen should be present inside as it could get there only by diffusion down the narrow clearance between the operating rod and its guide tube, 50 mm long. A spark could be produced outside the box only by the breaking of the 3-conductor cable.

"This cable is strengthened by the metallic braid and runs in a protected location along the structural member. It could not be determined whether or not the cable was definitely anchored to the member, nor whether the metallic braid was originally clamped to the metal box, because of damage in the fire."

In the light of all the available evidence on this point we believe that the possibility of igniting such mixture by the means just described was very slight.

RESONANCE EFFECT—HIGH FREQUENCY INDUCTANCE

An attempt was made to discover if the ignition of such mixture could have been laid to spark emission due to resonance effect upon metal parts of the ship's interior caused by received radio waves of high frequency.

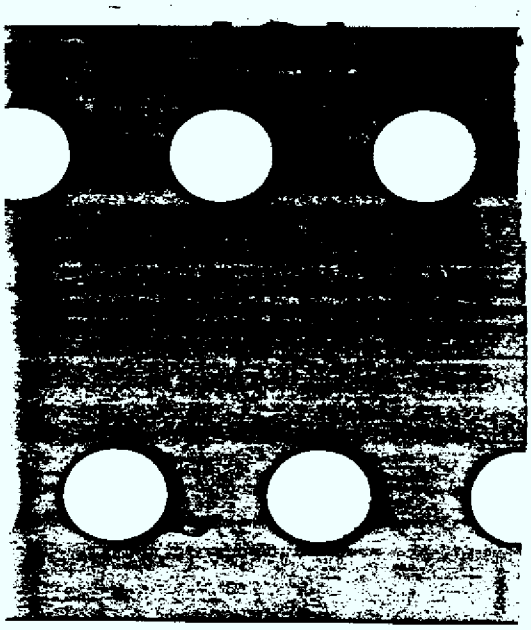
There was on the field at Lakehurst, a localizer beam radio transmitter of low power, maintained by an airline company, the on-course portion of which was so situated as to pass through the space occupied by the ship at the time it took fire. This transmitter was at that time about 1,800 feet from the ship. Its power output was 15 watts; its frequency 278 kilocycles. The maximum field strength authorized for this type of station is 1,500 microvolts per meter at 1 mile, which represents fifteen ten-thousandths of 1 volt per meter measured at 1 mile on the on-course portion of the range which, incidentally, is the area of weakest radiated power. The strength of this field is so low that it has been compared to the power of a fly. So far as could be determined, this localizer was the only transmitter that was operating at Lakehurst at the time in question. It is not believed that other high-frequency stations, at some distance from the field, could have had inductive effect upon the airship.

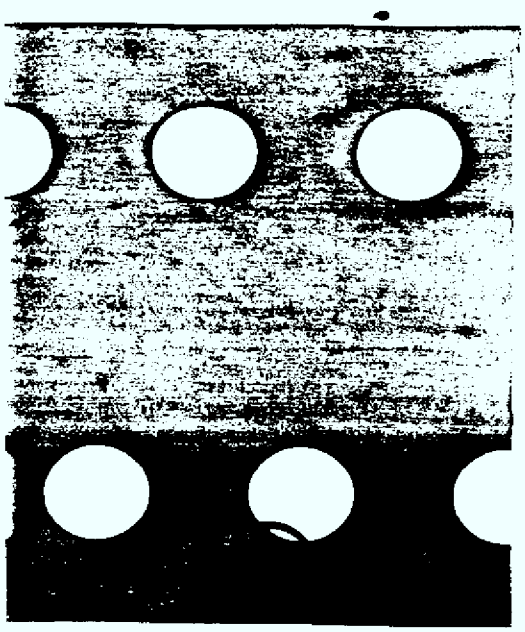
Witness Dieckmann, of the German Commission, stated that he and his colleagues had been particularly interested in the possibility of ignition through high-frequency radio induction, especially after hearing the testimony of Witness Freund who was engaged in paying out a length of the stern cable at frame 47 when the accident took place; that this part of the cable might have received impulses and thus electrical energy would have been conveyed into the inside of the ship. However, it appears that if such result was to occur due to inductive effect, a transmitter relatively close to the ship and of considerable power would have had to be operating at the time of the event. These conditions were not present.

Resonance effect due to high-frequency generation within the ship was impossible because all the ship's transmitters had been shut down before the appearance of fire. Furthermore, the ship was carefully shielded against resonance effects generated from within. Witness J. B. Whitehead put no stock in this possibility because of the small amount of energy that could have been involved. Furthermore, once inside the ship in the form of oscillations in the structure no damage could have been done, because the structure itself was so large and so complex that there was no possibility of a small amount of energy setting the whole ship in oscillation and that oscillation in separate parts, which perhaps contained high resistance, would be short-circuited by other parts of the ship. In view of the facts and the expert testimony given on this possibility, it may be said that in such inductance there was only the remotest chance that it was responsible for the elusive spark.

ELECTROSTATICS

Under this designation of electrical possibilities there is now to be considered a group distinguishable from current elec-





tricity and known as electrostatics. In this group, there is first mentioned a possibility due to the nature of the materials employed.

In the older type of cell fabric, containing a rubberized element, it was apparently possible to create a static spark by tearing the fabric. The cell fabric used in the *Hindenburg*, as far as we could learn, did not include material possessing this characteristic. Since virtually all of the cells were consumed by the fire, no test could be made of the cell fabric.

The two bungees in the stern of the ship connected to the horizontal members of the tail, contained some rubber, but as far as we know the bungees had not been damaged until after the fire had broken out.

Before proceeding further with the subject of electrostatics, it is to be remarked that an airship as a body is regarded as carrying an electric charge, the nature and extent of which depend upon the circumstances. In motion it may accumulate a charge either through friction with the air or perhaps by means of charged water drops such as may be found in clouds or mist. It may accumulate a charge of either positive or negative sign. Thunder clouds may carry a positive or a negative sign. According to the evidence in this instance, the ship is assumed to have carried a positive charge on its outer surface, which is a semiconductor. This phenomenon is due to the fact that an airship in flight is within the atmosphere which is electrified. A few of the more interesting features of this phenomenon are; that the earth ordinarily is charged negatively; that in the atmosphere there is an electrical field measured in volts per meter (potential gradient) which in fine weather amounts to 100 volts per meter, becoming higher as the weather grows more disturbed; that the tendency is for an equalization current to pass from the atmosphere to the ground; that the electrical conductivity of the atmosphere is greater when the atmosphere is humid.

Other facts and assumptions are that the total outer surface of the ship has a uniform potential; that the electrostatic effects on the outside of the ship are separate and apart from those on the inside; that a number of conditions tend to equalize the potential of the ship with the surrounding atmosphere; among these is the dissipation created by the exhaust gases and by the movement of propellers, the edges of the latter being metallically connected with the ship's structure; that the landing ropes would serve as conductors of the ship's charge and equalize the potential of the ship with that of the ground. When the ship is held by the landing ropes the electrostatic picture is such that the surface of the ship after a brief interval, so to speak, becomes a piece of the ground elevated into the atmosphere.

The potential differences measured vertically to the earth are called the potential gradient. This gradient is higher over those areas of the ship where the edges or points project into the atmosphere, especially over the bow and stern of the ship. It may be increased in the presence of charged clouds.

The principal protection against an electrostatic discharge which might serve to ignite an inflammable mixture in or about the ship is the bonding of the ship. Briefly such bonding is the connecting up of the many parts of the ship so that electrically it becomes one complete metallic whole. A possible test of the state of this bonding could have been made by detecting through the radio receivers the characteristic noise associated with interference created by imperfect bonding. In the present instance, as had been noted, the receiving system of the ship did not give indication that any injury had occurred to the ship's bonding prior to the accident.

We have also considered the possibility that due to a discharge between parts of the ship having different potentials, a spark might have been created. Whether such a discharge occurred we cannot say. According to the testimony, the ship was bonded in keeping with the best known practice.

There was one fixture of the ship in this respect that received more than passing notice—the unbonded electric wires at the stern electric lamp of the airship. Witness Dieckmann indicated that there might have been a static charge produced by this tail light wiring at the light bulb since the wiring within it was the only part of the ship which did not have the same potential as the remaining surface of the ship, a very small difference, however. Whether such a small electrostatic capacity as the lamp terminal would have been able to produce a spark is highly questionable. Another reason to regard it as improbable is that no one reported having seen the origin of the fire at the extreme rear end of the ship.

BALL LIGHTNING

A reading of the record reveals that some space is given to another manifestation of electrostatic discharge; namely, to the possibility that ball lightning might have accounted for the ignition of the mixture.

Ball lightning is supposed to be one of the peculiar species of lightning discharges that have been observed from time to time. One of its features is that like a drop of oil on water it spreads and splits into segments, some of which segments continue for a distance along objects on which they alight.

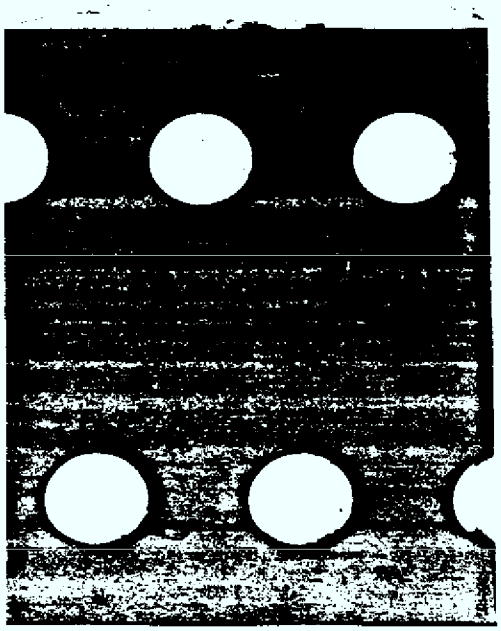
Although some authorities have disclaimed the existence of ball lightning, we have considered the idea for what it might be worth. It does not very well explain the slow burning that some of the witnesses described as having taken place at the beginning of the action. Moreover, the theory as applied in the present instance would appear to have little substance since no one testified to having observed any form of lightning.

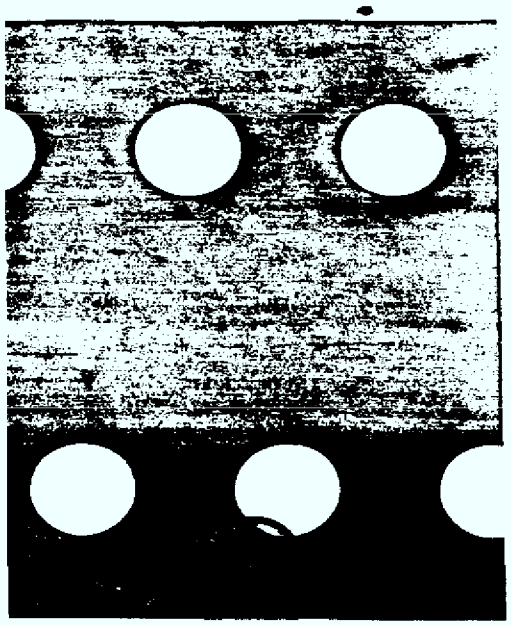
For the same reason any other claim made on the ground of lightning as a cause would also seem to fail, because none of the witnesses who testified stated that they observed any lightning flashes in the vicinity of the ship or heard an accompanying clap of thunder at the time of the accident.

BRUSH DISCHARGE, OR ST. ELMO'S FIRE

In order to develop the next possibility to be considered, viz. ignition due to brush discharge, or St. Elmo's fire, a few additional remarks are necessary upon the subject of electrostatics and the conditions that actually prevailed at the time and place of the accident.

It will be recalled that the bow port trail ropes first made contact with the extremely wet ground, 4 minutes before the fire. When they left the ship they appeared to be quite dry as dust was observed to fly from them as they descended. These ropes were made of hemp. The atmosphere at the time and place of landing was humid and the ship had absorbed moisture. It was, therefore, reasonable to suppose that in the interval the ropes continued to absorb moisture and their conductive qualities increased. Therefore, their contact with the ground under the circumstances would dis-





charge the static accumulated on the ship. Laboratory tests were made by the National Bureau of Standards of the electrical conductivity, at various humidities, of a section of the bow port trail rope, to determine whether the static discharge accumulated by the airship was or was not discharged when such rope made contact with the ground. Under the varying conditions employed in the tests, it was found that the airship would be 90 percent discharged in a period of from 0.6 second to 170 seconds after such rope came in contact with the ground.

With respect to the potential gradient existing in the atmosphere in which the ship was standing, witness F. W. Reichelderfer, naval aerologist, indicated that conditions were favorable to a steep potential gradient due to the existence of a thunderstorm condition. Witness Eckener also believed that a high potential gradient existed at the time and place of the accident. He apparently based his opinion upon the following: That a thunderstorm front had just passed over the station; that the heavy rain had become a light drizzle, thus reducing the potential gradient materially and that from his information the appearance of the sky showed a light stratus ceiling. He proceeded to say that if one closely examined the current registrations of winds, temperatures, and pressures, then one might recognize that the first thunder front must have had a smaller, lighter one following it, that the wind turned back to the southeast. Winds of the higher altitude remained westerly. The barometer curve showed a slight falling off of pressure and relatively the temperature started to rise again. That is, after the temperature had been brought down appreciably, by the breaking in of the cold air, the temperature remained constant for one-half hour before the landing maneuver to one one-half hour after the landing maneuver. Then the temperature again started to decline rapidly and the wind slowly turned back to the northwest.

This, according to the witness, the sensitive instruments show, and that if this was not noticed at the field it was quite natural because attention was focused on the landing maneuver and on the handling of the ship. (For registrations made by the sensitive instruments, referred to by witness Eckener, see appendix 47 containing graphs made at the naval air station, Lakehurst, N. J., May 6, 1937, including anemograph, thermograph and micro-barograph traces—correct within 5 minutes.)

He stated confidently that there was a small tail-end to the first thunderstorm that passed by, which most likely created a steeper potential gradient than would otherwise be expected. Whether this stronger gradient could have generated sufficient potential between the airship and the air masses above the ship so that an equalization of the gradient took place, either by St. Elmo's fire, or by a spark, he was unable to decide.

That the ignition was not effected by such a static equalization spark immediately after the landing lines had been dropped was because they then were dry, hence poor conductors. They slowly became damp in the light drizzle that was falling, and in such condition their conductivity became greater. Therefore, he believed that the potential between the ship and the ground was slowly equalized and afterward the potential gradient between the ship and the overlying air space was sufficient to generate these static sparks.

Witness Whitehead, in commenting upon these views respecting the potential gradient, said that if a secondary storm was present in sufficient intensity to cause a spark of lightning of any character that it would have been visible or audible. At any rate it would be reasonable to suppose that probably because of the preceding thunderstorm the potential gradient at the time and place of the accident was somewhat greater than normal.

Witness F. A. L. Dartsch, aerologist at the naval air station, appeared to have a somewhat different opinion. He stated that previous to the landing there had been heavy showers which could have produced a strong potential gradient but whether that still existed at the time of the accident when only a light rain was falling with just the clouds above, he could not definitely say. He did not believe that the potential gradient then existing was dangerous to the ship but he had no way of verifying his view. In answer to the question, "After the thunderstorm had disappeared, and the wind and rain had decreased, were there any signs or indication of a new small depression or squall?" Witness Dartsch said that the only indication they had had was the temporary shift from southeast to southwest with the slight—about one-hundredth inch—rise in pressure. However, no distinctive clouds of precipitation occurred with this change.

Brush discharge ordinarily is seen only after dark. It is manifested particularly from sharp points or projections of any material object that is charged to a sufficiently high electrostatic potential so that the charge dissipates. The effect is produced by particles of the material substance or by ionization of the gases of the atmosphere from impacts or stress. The ignition of a combustible mixture of gases in such a discharge is due to transformation of kinetic energy into heat from impacts of ions or particles. The brush discharge appears either reddish or bluish depending upon the electrical sign of the charge.

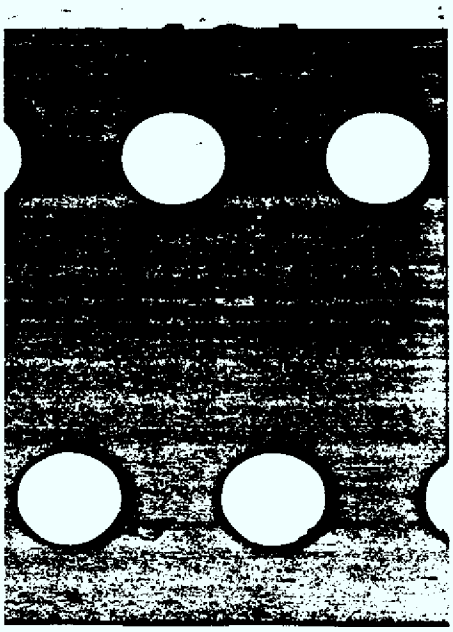
During the course of the public hearings, the question of whether a brush discharge would produce sufficient heat to ignite an inflammable hydrogen air mixture, was dwelt upon to a considerable extent. Since that time, further experiments have been made in the high-voltage laboratory of the National Bureau of Standards and it has been found possible to ignite hydrogen by a brush discharge by using somewhat more intense discharges than those previously tried with a somewhat slower velocity of the gas passing the needle point.

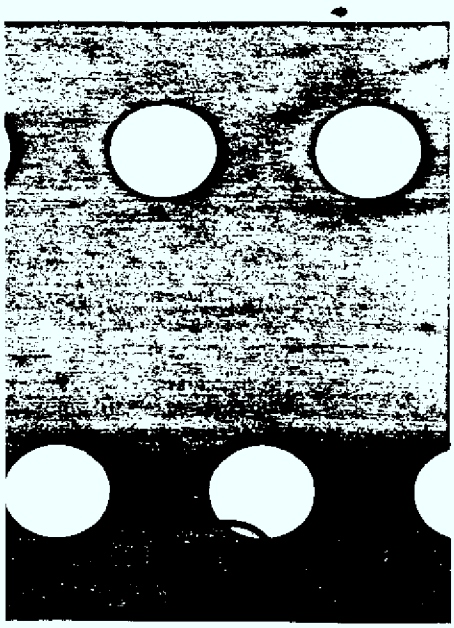
In this consideration of the possibility of brush discharge it is to be noted that no witness testified that a visible indication of it was present. This, however, may be accounted for by the fact that darkness had not yet fallen at the time of the accident.

Witness Whitehead was of the opinion that the continuous presence of brush discharge, sufficient to cause the ignition, would require a greater current intensity than could have been possible through a dry rope.

Another argument against the brush discharge theory advanced by Witness Whitehead was that there was much evidence that the first sign of fire was through the translucent skin at the point well away from the tip of the fin.

Witness Dieckmann in elaborating on this phenonemon stated that a one-hundredth or one-thousandth part of a watt, perhaps less, was all that would be necessary to ignite a mixture of air and hydrogen; that it was difficult for him to believe that brush discharge was responsible for the ignition; that none of the witnesses testified to its presence. He remarked upon the testimony as to the presence of glowing reflections of





COOKS

Xaver Maier, chief cook.
*Richard Mueller.
Alfred Stoeffler.
Alfred Groezinger.
*Fritz Flakus.
Werner Franz, mess boy.

OBSERVER

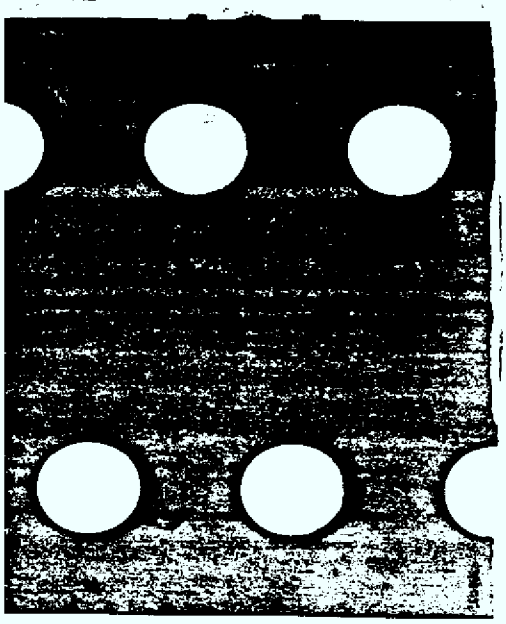
Capt. Anton Wittemann.

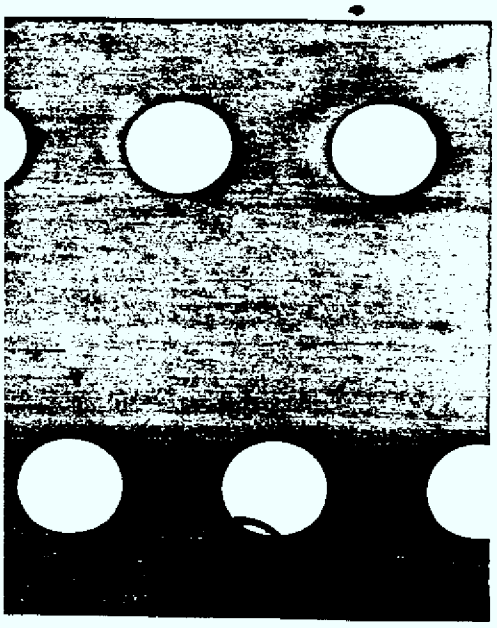
Appendix II

Passengers on board the airship *Hindenburg* on its departure from Frankfurt-am-Main, Germany, on May 3, 1937, were as follows:

Adelt, Gertrude, Berlin, Germany.
Adelt, Leonhard, Berlin, Germany.
*Anders, Ernst Rudolf, Dresden, Germany.
Belin, Peter, Washington, D. C.
*Brink, Birger.
Clemens, Carl Otto, Bonn, Germany.
*Doehner, Hermann, Mexico City, Mexico.
*Doehner, Irene, Mexico City, Mexico.
[illegible]er, Matilda, Mexico City, Mex-
Do[illegible], Walter, Mexico City Mexico.
Doehner, Werner, Mexico City, Mexico.
*Dolan, Curtis, France.
*Douglas, Edward, New York.
*Erdmann, Fritz.
Ernst, Elsa, Hamburg, Germany.
*Ernst, Otto C., Hamburg, Germany.
*Feibusch, Moritz, Lincoln, Nebr.
Grant, George, London, England.
Heidenstamm, Rudolf von.
Herschfeld, George, Bremen, Germany.
Hinkelbein, Claus.
Kleeman, Marie.
*Knoecher, Erich, Zeulenroda, Germany.
Leuchtenberg, William, New York.
Mangone, Philip.
Mather, Margaret.
Morris, Nelson.
O'Laughlin, Herbert.
Osbun, Clifford, Chicago, U. S. A.
*Pannes, Emma, New York.
*Pannes, John, New York.
*Reichold, Otto, Vienna, Austria.
Spaeh, Joseph.
Stoeckle, Emil.
Vinholt, Hans, Copenhagen, Denmark.
Witt, Hans.

* Indicates those who died in accident.





fire which had moved from the stern forward but stated that such references to reflections were peculiarly indefinite and uncertain.

Of related interest to brush discharge was the opinion of witness Earle that in an atmosphere of high humidity, static electricity could be attracted to the top points of the ship when the ship's mooring ropes came into contact with the ground sufficient to cause a spark to jump across the mixture of hydrogen and air, saying that such would be possible if the ship was in relatively slow motion, while gas was being valved, placing a layer of gas between the ship and the damp atmosphere. The concentrated atmosphere between the cloud and the ship would reduce resistance to permit sparking and if the potential of the ship was the same as that of the ground there would be a possibility of sparking across; that it is easier to spark through hydrogen than through air.

The meteorological records and related data of the investigation were made available to Dr. W. J. Humphreys of the United States Weather Bureau. He has concluded after making a study of such material that, "a brush discharge, or several of them, very well might have occurred on the ship after, not before, the landing ropes came into contact with the ground; that this brush discharge would have continued for some time; that it would have been invisible (being in daylight); that such a discharge likely would have ignited any adequately rich stream of leaking hydrogen that reached it; and that from the point of ignition the flame would have shot back to the leak, there quickly would have burnt a larger opening and set going a conflagration of great violence and rapidity."

Conclusion

The cause of the accident was the ignition of a mixture of free hydrogen and air. Based upon the evidence, a leak at or in the vicinity of cells 4 and 5 caused a combustible mixture of hydrogen and air to form in the upper stern part of the ship in considerable quantity; the first appearance of an open flame was on the top of the ship and a relatively short distance forward of the upper vertical fin. The theory that a brush discharge ignited such mixture appears most probable.

Respectfully submitted,

SOUTH TRIMBLE, JR.,
Solicitor.

R. W. SCHROEDER,
Asst. Director, Bureau of Air Commerce.

DENIS MULLIGAN,
Chief, Regulation and Enforcement Division, Bureau of Air Commerce.

Approved:

DANIEL C. ROPER,
Secretary of Commerce.

Appendix I

Officers and crew on board the airship *Hindenburg* on its departure from Frankfurt-am-Main, Germany, on May 3, 1937, were as follows:

*Capt. Ernst Lehmann.
Capt. Max Pruss, commanding.

WATCH OFFICERS

Albert Sammt.
Heinrich Bauer.
Walter Ziegler.

NAVIGATORS

Max Zabel.
Franz Herzog.
Christian Nielsen.
Kurt Bauer.

RADIO OFFICERS

*Willy Speck, chief radio operator.
Herbert Dowe.
*Franz Eichelmann.
Egon Schweikard.

ENGINEERING OFFICERS

Rudolf Sauter, chief engineer.
Eugene Schaeuble.
*Wilhelm Dimmler.

ELEVATORMEN

*Ludwig Felber.
*Ernst Huchel.
Eduard Boetius.

HELMSMEN

*Alfred Bernhard.
Helmut Lau.
Kurt Schoenherr.

ELECTRICIANS

Philip Lenz, chief electrician.
Joseph Leibrecht.
*Ernst Schlapp.

MECHANICS

*Walter Bahnholzer.
Eugen Beutele.
*Rudy Biallas.
August Deutschle.
Jonny Doerflein.
Adolf Fischer.
*Albert Holderried.
Richard Kollmer.
*Robert Moser.
*Alois Reisacher.
Theodor Ritter.
Raphael Schaedler.
*Willy Scheef.
*Joseph Schreihmueller.
Wilhelm Steeb.
*Alfred Stoeckle.
German Zettel.

RIGGERS

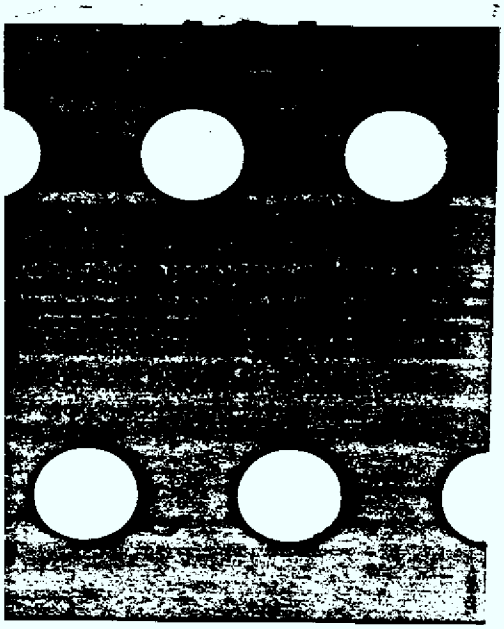
*Ludwig Knorr, chief rigger.
Hans Freund.
*Erich Spehl.

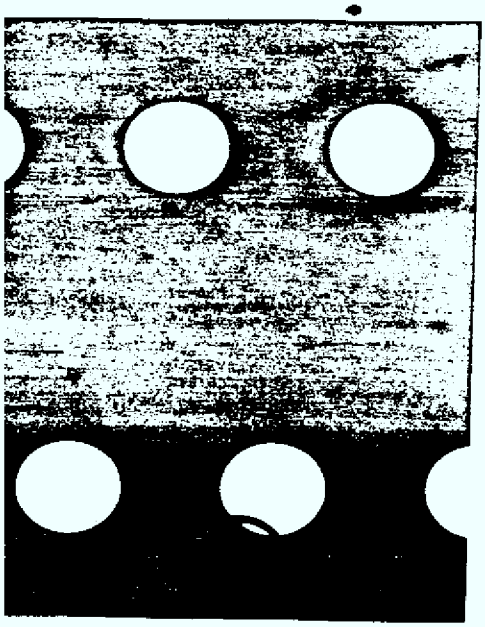
STEWARDS

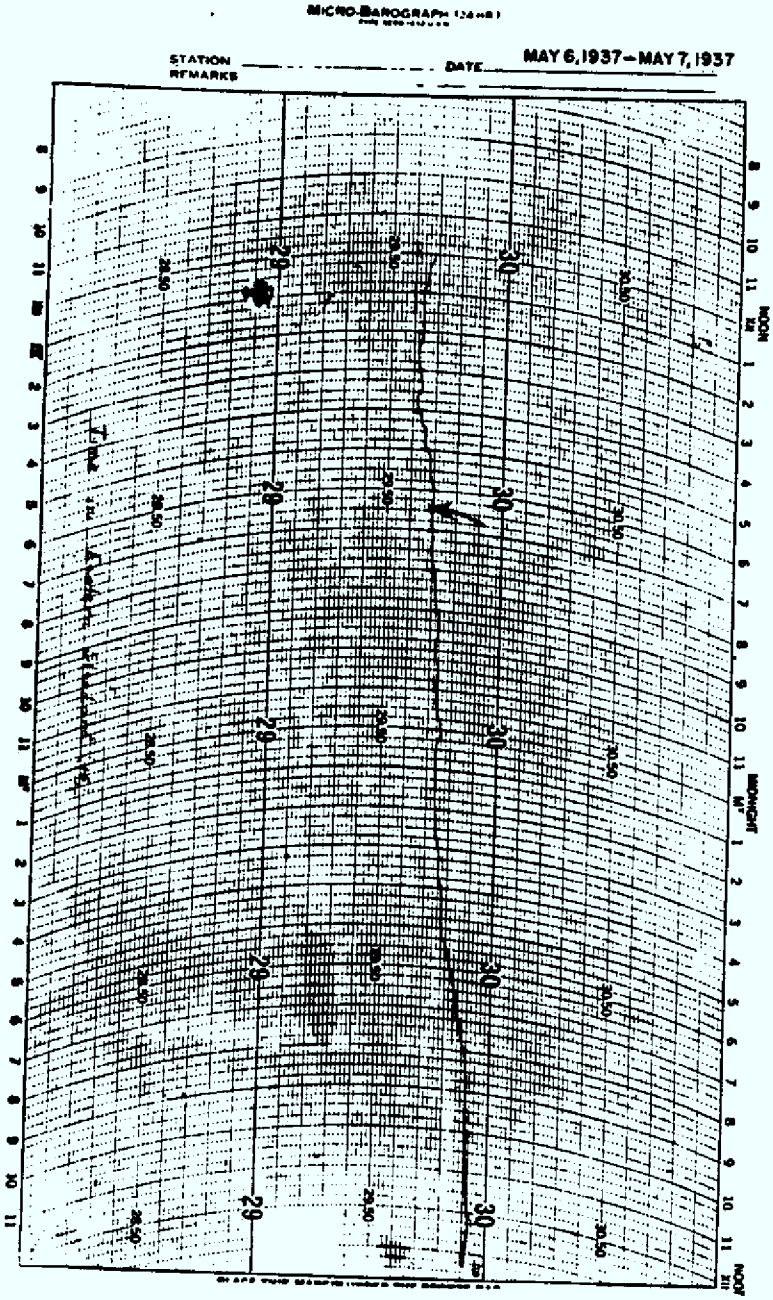
Heinrich Kubis.
Wilhelm Balla.
Fritz Deeg.
Max Henneberg.
Severin Klein.
Eugen Nunnenmacher.
*Max Schulze.

Frau Imhoff, stewardess.
Dr. Ruediger, ship's doctor.

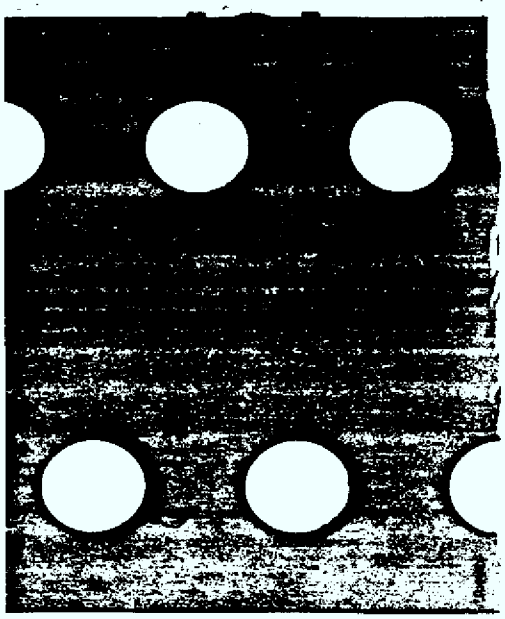
* Indicates those who died in accident.

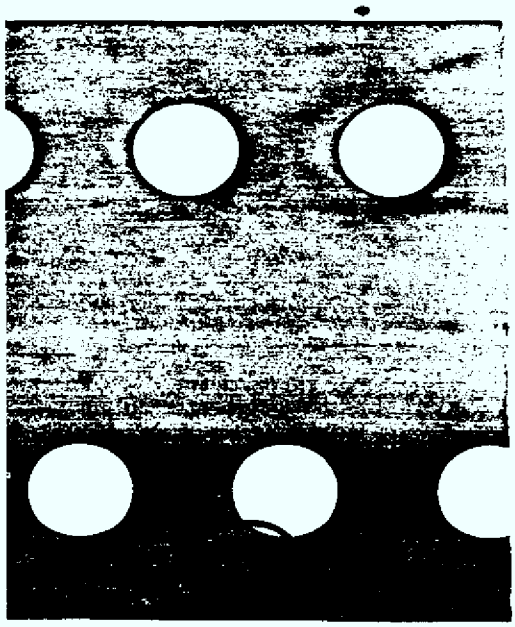


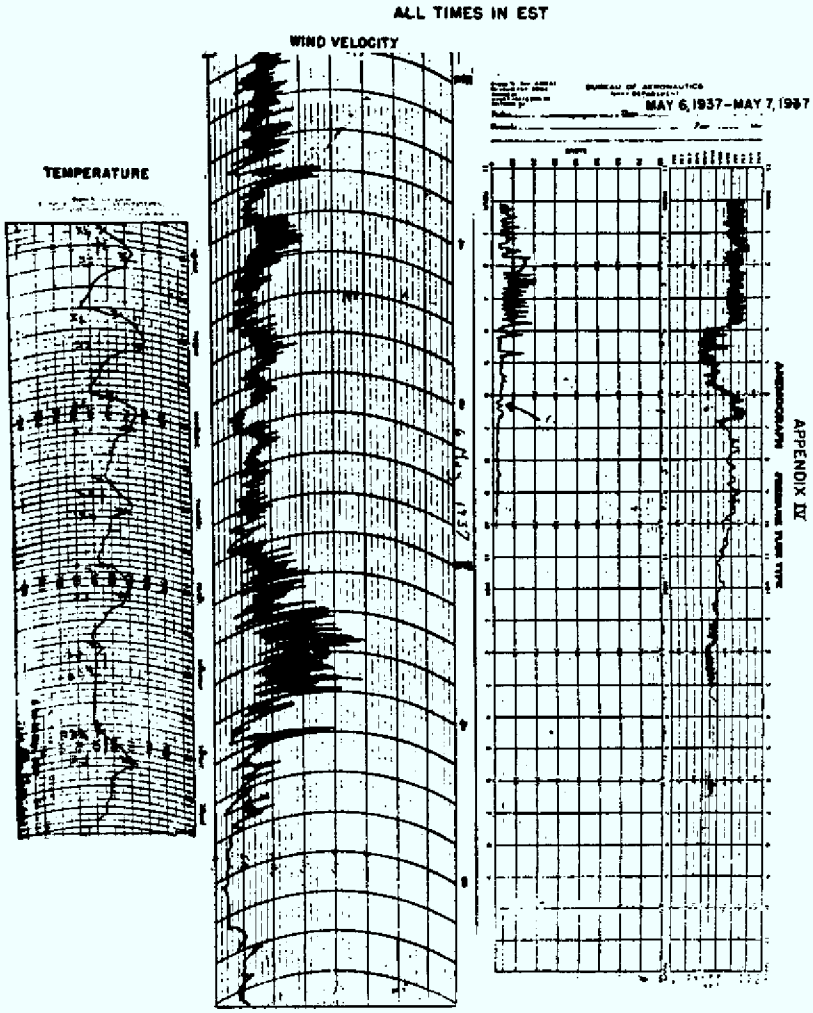


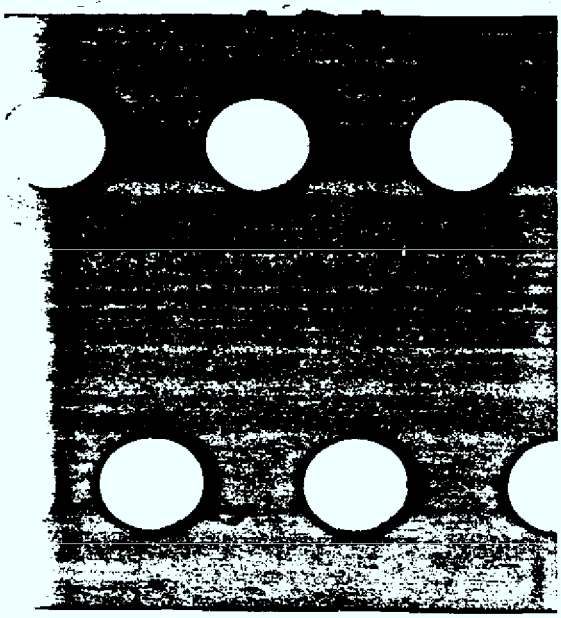


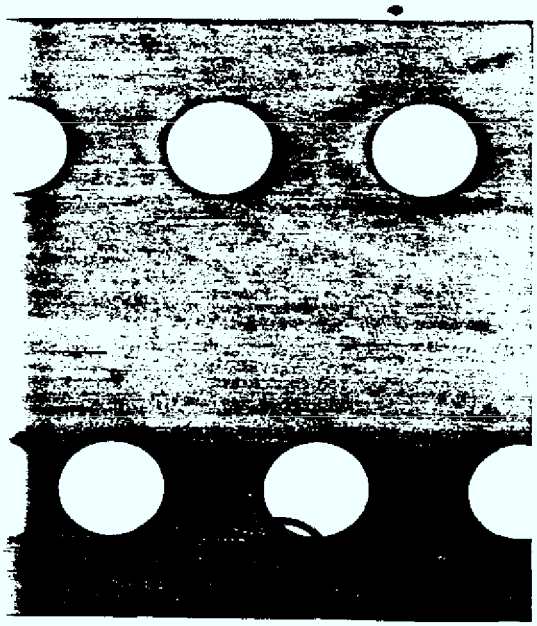
APPENDIX IV (CONT'D.)






ALL TIMES IN EST
WIND VELOCITY
TEMPERATURE
MAY 6, 1937–MAY 7, 1937
APPENDIX IV





tions inimical to unrestrained flights, the importance of certain types of flight operations transcend the importance of other types of flight operations. It also must weigh the needs of any one type of flying as balanced against the needs of other types of flying and assist the Bureau of Air Commerce in determining under what conditions and to what extent the Bureau must begin to apply and enforce restrictions in the use of the civil airways.

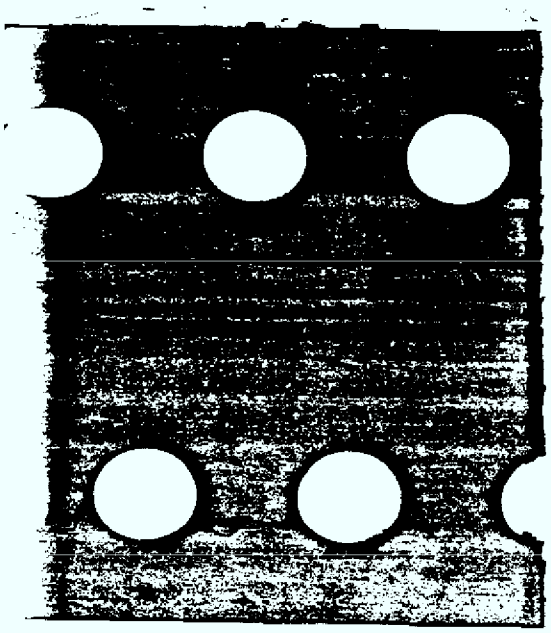
It is believed that this committee, representing as it does the several phases of military aviation, private operator, the scheduled air line operator, the communication organization, and the regulatory body of the Bureau of Air Commerce itself, as well as communication agencies, will furnish a complete, well-rounded picture of the immediate needs of the different types of flying now properly making use of the aids to air navigation furnished and operated by the Bureau of Air Commerce.

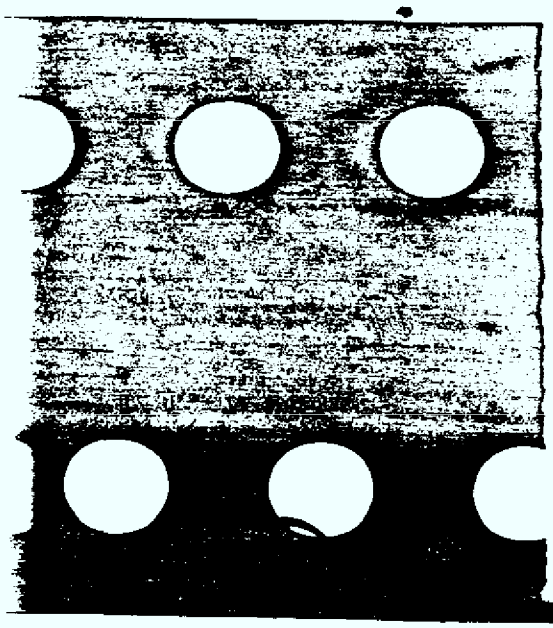
The committee, which is composed of the following members, held its first meeting on July 7: Capt. J. E. Webb (representing the National Aeronautic Association), Chas. A. Massom, secretary, State Aviation Commission of Maryland; Paul Goldsborough, president, Aeronautical Radio, Inc.; Commander O. B. Hardison, United States Navy, Navy Department; David L. Behncke, president, Air Line Pilots Association; Lt. G. H. Bowerman, Aviation Division, United States Coast Guard; Maj. A. W. Marriner, Army Air Corps; S. S. Kenworthy (representing American Municipal Association); Fowler W. Barker, secretary, Air Transport Association of America.

At the first meeting the committee members were presented with an initial list of subjects to be studied and after general discussion, it was agreed that each member be assigned one or more of the problems with which he is familiar. After determining facts surrounding such problems, the members were to submit complete data to the committee for general discussion and agreement. The subjects and assignments follow:

Study of present airway traffic control system in all phases of procedure, and recommendations for improvement.

1. Designation of primary and secondary airways. (Air Line Pilots Association; Airway Traffic Control.)
2. Reduction in airway width. (War Department; Navy Department.)
3. Restriction of number of airports and bad weather operations near major terminals. (National Association of State Aviation Officials; Airway Traffic Control.)
4. Procedure to be followed in setting up safety agreements by various services, groups, or areas. (Not assigned; for general discussion.)
5. Licensing of airport control tower operators. (American Municipal Association.)
6. Division of authority between airway traffic control station and airport control towers. (American Municipal Association; National Association of State Aviation Officials; Air Transport Association of America.)
7. Priority in clearing flights of various class services into airport under conditions of landing sequence assignments. (National Aeronautic Association.)
8. Closing of airways or airports to various types of traffic according to weather. (National Aeronautic Association; American Municipal Association.)
9. Penalties to be invoked for violating airway traffic control regulations. (American Municipal Association.)
10. Civil air regulations no. 60—Air traffic control, including adoption of consolidated interline safety agreement provisions to fit all flying. (Bureau of Air Commerce.)
11. Jurisdiction of airway traffic control in authorizing clearance for military intentional instrument flights along or across airways. (War Department; Navy Department.)
12. System of coordination of all military traffic into other traffic at all times. (War Department; Navy Department.)
13. Discussion as to necessity for flight plans for all itinerant flight movements along or across airways under all weather conditions including the requirements of radio fix reports with the establishment of communication facilities. (Navy Department; National Aeronautic Association.)
14. Two-thousand-foot free zone or substitute for aircraft without two-way radio. (Navy Department; National Aeronautic Association; Air Transport Association.)
15. Discussion as to the necessity of the establishment of a dispatching agency for the purpose of exercising flight control authority over all other than air line movements. (National Aeronautic Association.)
16. Establishment of maximum altitude zones for the entire country measured above the terrain, allowing contact flight at an altitude under the specified maximum altitude. Such flight plan to be merely termed "contact." How far below cloud base and with what visibility day or night? (National Aeronautic Association.)
17. Discussion as to steps necessary to expedite communication in forwarding information required by airway traffic control, such as dispatches and ship reports. (Aeronautical Radio, Inc.; War Department.)
18. Discussion as to advisability of airway traffic control managers taking up irregularities and violations of airway traffic control procedures directly with local supervising aeronautical inspector, immediately upon their occurrence. (Not assigned, for general discussion.)
19. Plan for handling traffic beyond capacity of one airport on a civil airway by rerouting or holding at point of origin. (National Aeronautic Association; Air Transport Association.)
20. Direction communication expansion should follow—radio? ground? (War Department; Navy Department; Aeronautical Radio, Inc.)
21. Should any of the following frequencies be changed or discontinued for itinerants?—3105, 6210, 3120 kilocycles.





Bureau of Air Commerce Advisory Board Holds First Meeting

As a medium through which the Bureau of Air Commerce can obtain the viewpoints and counsel of other Federal agencies having to do with aeronautics and of national organizations representing the aeronautics industry, the Department of Commerce has established a Bureau of Air Commerce Advisory Board. The first meeting, held on August 6, was a luncheon at the Willard Hotel in Washington.

Monthly meetings are planned with Secretary of Commerce Daniel C. Roper, Assistant Secretary of Commerce J. Monroe Johnson, and the members of the Bureau's own Policy Board representing the Department. The Policy Board consists of Director of Air Commerce Fred D. Fagg, Jr., the Assistant Director, the Technical Assistant to the Director and the chiefs of the Bureau's seven divisions.

These meetings will be devoted to consideration of important national aeronautical problems and the formulation of national policies with respect thereto.

The members of the Bureau Advisory Board are:

Hon. R. Walton Moore, counsellor, Department of State.
Hon. Stephen B. Gibbons, Assistant Secretary, Treasury Department.
Gen. Oscar Westover, Chief of Air Corps, War Department.
Hon. Harllee Branch, Second Assistant Postmaster General, Post Office Department.
Admiral Arthur B. Cook, Chief, Bureau of Aeronautics, Navy Department.
Hon. Willis R. Gregg, Chief, Weather Bureau, Department of Agriculture.
Hon Carroll Miller, chairman, Interstate Commerce Commission.
Dr. George W. Lewis, Director of Aeronautic Research, National Advisory Committee for Aeronautics.
Hon. Corrington Gill, Assistant Administrator, Works Progress Administration.
Rear Admiral Emory S. Land, member, United States Maritime Commission.
Hon. Gill Robb Wilson, president, National Association of State Aviation Officials.
Hon. Charles F. Horner, president, National Aeronautic Association.
Hon. Andrew Joyner, Jr., president, American Municipal Association.
Hon. Leighton W. Rogers, president, Aeronautical Chamber of Commerce.
Hon. Wm. A. Schnader, chairman, Committee on Aeronautical Law, American Bar Association.
Dr. W. W. Arrasmith, president, Aviation Commission, American Legion.
Col. Robert G. Elbert, chairman, Business Advisory Council.
Mr. James E. Hoskins, chairman, Aviation Committee, Actuarial Society of America.
Col. Edgar S. Gorrell, president, Air Transport Association of America.

Air Lines Employ 286 Hostesses and 105 Stewards

There are 286 young women employed as hostesses, and 105 men employed as stewards on American-operated air lines, according to the most recent reports from the lines to the Bureau of Air Commerce, Department of Commerce. Seven domestic air lines employ hostesses. One domestic line and two lines extending to foreign countries employ stewards.

In October 1936 there were 270 hostesses, all on domestic lines. There was 1 male steward on a domestic air line at that time and there were 41 stewards on foreign extensions.

The air lines which have hostesses on their airplanes include American Airlines, Braniff Airways, Grand Canyon Airlines, National Airlines System, Transcontinental & Western Air, United Air Lines, and Western Air Express. Eastern Air Lines employs 43 stewards and Pan American Airways, operating to Latin America and across the Pacific, has 51 stewards; Pan American Grace, 11 stewards.

The Bureau of Air Commerce has no jurisdiction over hostesses and stewards, as it does with respect to qualifications of pilots and dispatchers, and airworthiness of equipment, but does request the lines to include in their reports the number of hostesses and stewards employed.

Advisory Committee Formed to Assist in Civil Airway Operation Problems

An Airways Operation Advisory Committee has been organized under the sponsorship of the Bureau of Air Commerce for the purpose of securing the best thoughts of flight sections of the various aviation interests throughout the United States, looking toward a long-time planning program for the operation of the civil airways of this country.

The various aviation groups concerned were asked to designate representatives on the committee in order that problems peculiar to each of them would be given consideration in the final recommendations made to the Secretary of Commerce for guidance in the issuance of necessary instructions to those operating, as well as using the civil airways and the facilities thereon.

As an illustration of problems before the committee, it must consider whether or not, under certain condi-

Dr. Merrill W. Hollingsworth, 1806 North Main Street, Santa Ana, Calif.

Dr. Samuel B. Randall, 84 Walnut Avenue, Santa Cruz, Calif.

Dr. Victor W. Hart, 113 North Oregon Street, Yreka, Calif.

Dr. George E. Hearst, 301½ Main Street, Cedar Falls, Iowa.

Dr. S. Senior Sack, 96 East Fifty-fourth Street, Brooklyn, N. Y.

The following-named physicians are no longer conducting examinations for the Bureau of Air Commerce:

Dr. Dwight H. Trowbridge, Sr., Fresno, Calif.

Dr. Joseph G. Zimmerman, Traverse City, Mich.

Dr. Edgar Childrey, Jr., Rochester, Minn.

Airports, Charts, and Lights

Airports of Entry

Temporary Airports of Entry Redesignated

The following temporary airports of entry have been redesignated for the period of 1 year:

Name of airport	Date of redesignation
Buffalo Marine Airport, Buffalo, N. Y.	July 29, 1937
Sault Ste. Marie Airport, Sault Ste. Marie, Mich.	Aug. 4, 1937

Airport of Entry Designated Without Time Limit

Rouses Point, N. Y.—The Rouses Point seaplane base has been designated an airport of entry without time limit, effective July 14, 1937.

Number of Airports and Landing Fields in the United States as of Aug. 1, 1937

Municipal airports	750
Commercial airports	443
Department of Commerce intermediate fields	268
Army airdromes	61
Naval air stations (including Marine and Coast Guard)	27
State-operated fields	46
Marked auxiliary fields	636
Private fields	75
Fields for miscellaneous Government activities	28
Total	2,354

Airports and landing fields having any night lighting equipment:	
Municipal	261
Commercial	93
Intermediate	280
Army	32
Navy	11
State	9
Auxiliary	9
Private	8
Total	703

Department of Commerce Aeronautical Charts

The following aeronautical charts are now available for distribution:

Dubuque (revised as of June 1937).
El Paso (revised as of July 1937).
Savannah (revised as of June 1937).

Copies may be obtained from the office of the Director, Coast and Geodetic Survey, Washington, D. C., at a cost of 40 cents each for single copies. A discount on aeronautical charts and books will be allowed only on orders amounting to a gross value of $10 or more. The discount on such orders (which may be assorted) will be 33⅓ percent.

Private Aeronautical Lights

Los Angeles, Calif.—The directional projector of the beacon near Montebello has been returned to normal operation, pointing toward Alhambra Airport instead of Eastside Airport as heretofore.

Mason, Ohio.—The Crosley Radio Corporation red revolving beacon not burning until further notice.

Licenses, Approvals, and Ratings

Summary

Pilot licenses, active	16,799
Scheduled air transport pilot ratings, active	1,000
Student licenses, active	36,151
Glider pilot licenses, active	190
Student glider pilot permits, active	135
Mechanics licenses, active	9,132
Parachute rigger licenses, active	375
Aircraft licenses, active	7,971
Aircraft unlicensed, active	1,710
Glider licenses, active	32
Glider unlicensed, active	327
Approved-type certificates issued for airplanes	649
Approved-type certificates issued for gliders	4
Approved-type certificates issued for engines	179

(Navy Department; Aeronautical R. Inc.)

22. Should the above be replaced at some definite date by ultra-high frequencies for transmission from aircraft? (Navy Department; Aeronautical Radio, Inc.)

23. Should the whole aircraft system of two-way communication be revamped for using ultra-high or some high frequencies by zones so all aircraft within a zone and perhaps the ground stations in the same zone would be on the same channel? (Navy Department: Aeronautical Radio, Inc.)

24. Should PX reporting and flight plans be combined into a common PX form? (Navy Department; Coast Guard.)

25. Does the Weather Bureau need additional personnel, and at what stations; how many additional men at such stations to expedite information, particularly discussions before flights? (Not assigned, for general discussion.)

Domestic Air Transport Lines Carry 110,842 Passengers in June 1937

The 20 scheduled air lines operating in continental United States in June 1937 carried 110,842 passengers, and flew 5,811,404 miles and 47,290,279 passenger-miles, according to reports to the Bureau of Air Commerce, Department of Commerce.

The lines carried 650,709 pounds of express and flew 377,223,690 express-pound-miles during the month.

Comparisons with April and May of this year and with June 1936 are shown in the following:

	April 1937	May 1937	June 1937	June 1936
Companies operating	20	20	20	21
Companies reporting	20	20	20	21
Passengers carried	76,199	98,035	110,842	97,453
Express carried (pounds)	540,310	591,011	650,709	701,142
Express-pound-miles flown	321,929,629	342,175,590	377,223,690	344,433,493
Miles flown	5,350,093	5,783,643	5,811,404	5,619,896
Passenger-miles flown	33,136,248	42,019,428	47,290,279	40,252,357
Passenger-seat-miles flown	62,762,041	70,905,514	71,966,329	59,094,819
Percent used—seats	52.80	59.26	65.71	68.11

German Air Line To Make Experimental Flights to United States This Summer

Secretary of Commerce Roper made the following announcement at his weekly press conference on July 7:

The German air line, Deutsche Lufthansa, A. G., will conduct a series of experimental flights across the Atlantic by way of the Azores, beginning with a flight from Frankfort, Germany, August 14.

Secretary Roper announced that the Department of Commerce has given its permission for eight round-trip flights with heavier-than-air craft which the company plans to make during the summer of 1937.

Col. J. M. Johnson, Assistant Secretary of Commerce, stated that a second flight from Germany will commence August 28, and the first return flight will begin August 31. The base in this country will be at Port Washington, Long Island. In 1936, the Deutsche Lufthansa conducted four trial flights to the United States in two heavier-than-air craft.

The eight trips this summer will be made in four-engine seaplanes, each of which carries a crew of four. No passengers or goods will be carried.

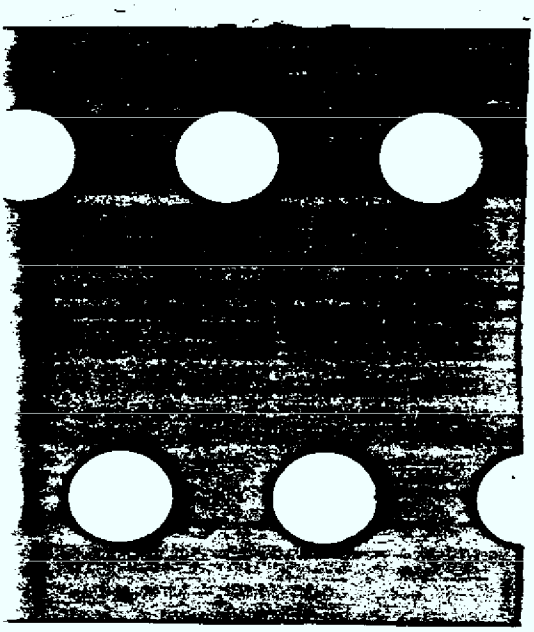
Two catapult ships will be used as ocean bases, one stationed near the Azores and the other near the American coast. The ships also will be equipped with meteorological stations and radio.

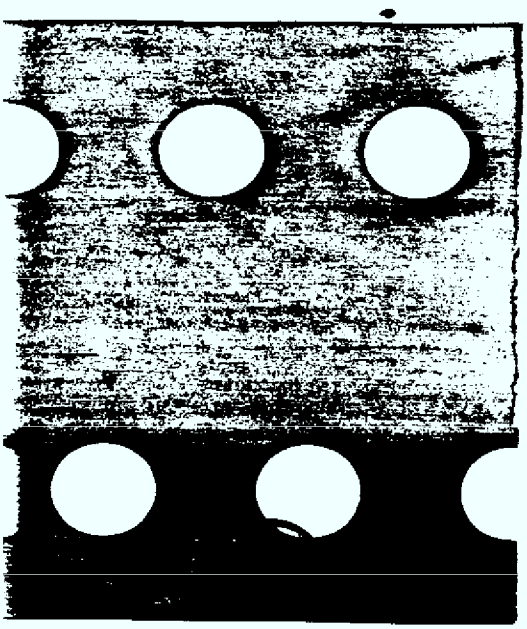
Designation of Medical Examiners

During the month of June 1937 the following physicians were officially authorized to act as Bureau of Air Commerce medical examiners in the cities specified.

Alabama.—Dr. Wallace B. Sargent, 313½ Montgomery Avenue, Sheffield.
California.—Dr. Dwight H. Trowbridge, Jr., 715 T. W. Patterson Building, Fresno.
Minnesota.—Dr. William R. Lovelace, Mayo Clinic, Rochester.
Montana.—Dr. Earl M. Farr, 221 Hart-Albin Building, Billings.
Texas.—Dr. Sam S. Templin, United States National Bank Building, Galveston.
Wyoming.—Dr. Robert V. Batterton, 10 Osborne Building, Rawlins.

The following-named physicians changed their addresses during the month, their new addresses being as follows:





Approved-type certificates issued for propellers	595
Approved-type certificates issued for parachutes	57
Approved-type certificates issued for aircraft components and accessories	77
Letters of approval issued for airplanes	539
Letters of approval issued for gliders	6
Letters of approval issued for domestic engines	11
Engines having calibration rating	9
Letters of approval issued for propellers	119
Letters of approval issued for pontoons	32
Letters of approval issued for skis	31
Letters of approval issued for foreign engines	15
Repair stations approved, active	189
Schools approved, active	29
Ground instructors licensed, active	52
Flying instructors ratings, active	84

New Approved-Type Certificates

Approved-type certificates (certificate numbers and dates in parentheses) have been issued the following:

AIRPLANES

Waco, UPF-7 and VPF-7, 8-place open land biplane. Engine, Continental W670K or K1 (UPF-7) or Continental W670M or M1 (VPF-7). (642, 6-5-37.) Listed as pending in July 15, 1937.

Douglas, DTS-A, 31-place closed land monoplane. Engines, 2 P & W Twin Wasp SB3G's at 900 h. p. or 2 P & W Twin Wasp SB-G's at 900 h. p. (647, 6-30-37.)

Waco, UKS-7 and VKS-7, 5-place closed land biplane. Engine, Continental W670K or K1 (UKS-7) or Continental W670M or M1 (VKS-7). (648, 6-8-37.)

Beechcraft, D17S, 5-place closed land biplane. Engine, P & W Wasp Jr. SB. (649, 7-16-37.)

ENGINES

Kinner, SC-7, 7-cyl. radial air cooled, 350 h. p. at 1,900 r. p. m. at 5,000 ft. altitude. (175, 6-5-37.) Listed as pending in July 15, 1937.

Wright, Double Row Cyclone GR-2600A-2, 14-cyl. radial air cooled—3:1 reduction gears, 1,200 h. p. at 2,100 r. p. m. at 5,700 ft. pressure altitude. (176, 6-10-37.) Listed as pending in July 15, 1937.

Allison, V1710-C4, 12-cyl. vee liquid cooled—2:1 reduction gears, 1,000 h. p. at 2,600 r. p. m. at sea level. (177, 7-13-37.)

Waterman-Studebaker, S-1, 6-cyl. in line liquid cooled, 90 h. p. at 1,800 r. p. m. at sea level. (178, 7-15-37.)

Pratt & Whitney, Twin Wasp Jr. SB4-G, 14-cyl. radial air cooled, 750 h. p. at 2,550 r. p. m. at 9,500 ft. altitude. (179, 7-22-37.)

PROPELLERS

Maynard Di Cesare, DC-500-1, steel, 9 ft. 0 in. diameter, adjustable pitch, 330 h. p., 2,000 r. p. m. (580, 6-9-37.) Listed as pending in May 15, 1937.

Curtiss, 89305 blade, aluminum alloy, 12 ft. to 10 ft. 6 in. diameter, controllable pitch, 285 h. p., 1,445 r. p. m. (592, 7-10-37.)

Everel, I-38-A, birch with fabric or stainless steel tipping, 6 ft. 4 in. diameter, automatic pitch, 40 h. p., 2,575 r. p. m. (593, 7-19-37.)

Hartzel, 419B, birch or quartered oak with brass or stainless steel tipping, 6 ft. 6 in. diameter, 4 ft. 2 in. pitch, 90 h. p., 2,250 r. p. m. (594, 7-26-37.) 595—pending.

Letters of Approval

(Numbers and dates in parentheses)

AIRPLANE

Vultee, V-1A Special, 8-place closed land monoplane. Engine, Wright Cyclone SR-1820G-5, 850 h. p. (2-539, 7-8-37.)

GLIDER

Sport-Flugzeugbau, Hutter H-17, 1-place open land monoplane (sailplane). 2-6, 7-26-37.)

Change in List of Approved Schools

Change name of Roosevelt Aviation School, Inc., Roosevelt Field, Mineola, Long Island, N. Y., to Roosevelt Field, Inc., Aviation School Division.

Repair Stations Issued Approved Repair Station Certificates

New York State Aviation Repair Station, 525 John Street, Utica, N. Y., approved July 6, 1937, for repair of welded steel tube structure, wooden structure, fabric covering wood-covered wings, fuselages and control surfaces, and box and laminated spars, steel fittings, and assembly.

Pennsylvania-Central Airlines Corporation, Allegheny County Airport, Pittsburgh, Pa., approved July 15, 1937, for repair of welded steel tube structure, wooden structure, excluding box and laminated spars wood-covered fuselages, wings and control surfaces, fabric covering, steel fittings, aluminum alloy structure, aluminum alloy fittings, assembly, aluminum alloy propeller blades and/or steel hubs, engines, and instruments.

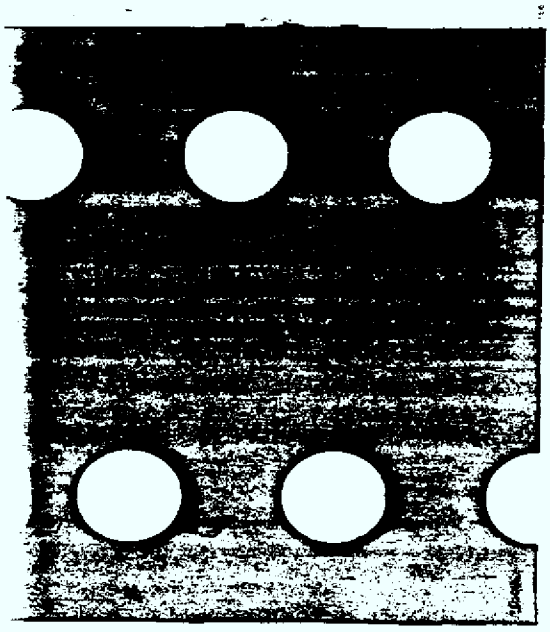
Changes in List of Approved Repair Stations

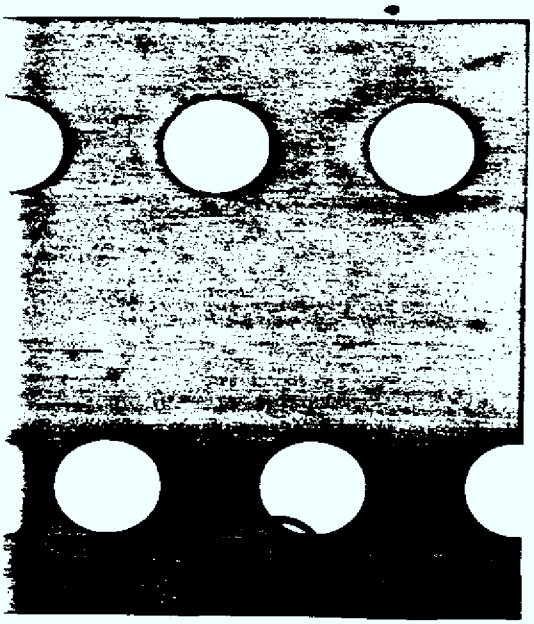
Delete Atlanta Air Services, Candler Field, Atlanta, Ga.

Commercial Aircraft Co., Inc., Portland Airport, Portland, Oreg., delete for repair of welded steel tube structure, excluding fittings, and steel fittings.

Inter City Airlines, Inc., Boston Municipal Airport, East Boston, Mass., add for repair of aluminum alloy structure, aluminum alloy fittings, aluminum alloy propeller blades and/or steel hubs, wooden propellers, engines, and instruments.

Delete Pacific Aircraft Repair Co., Los Angeles Airport, Inglewood, Calif.





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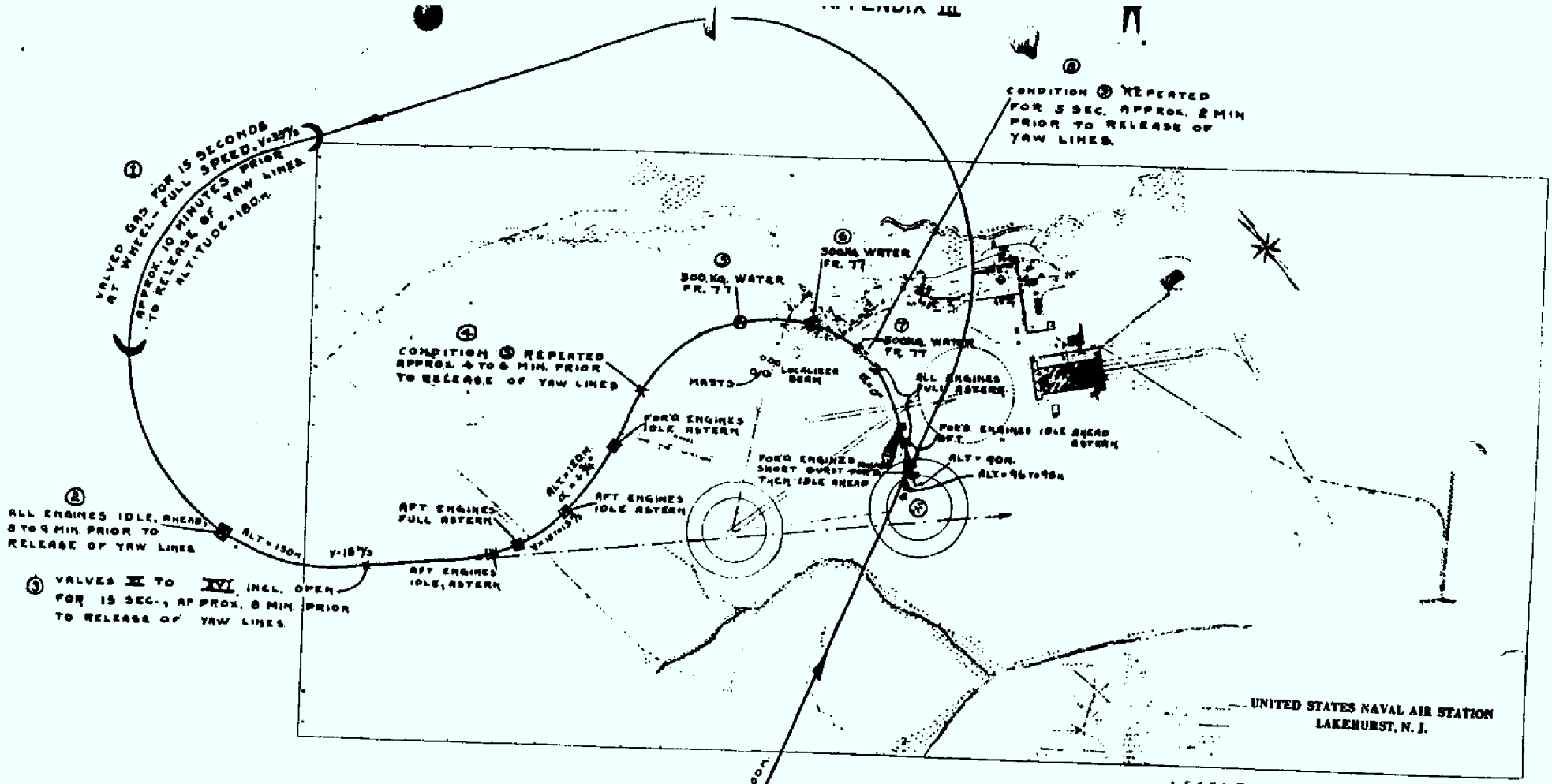
U. S. GOVERNMENT PRINTING OFFICE: 1937

APPENDIX III



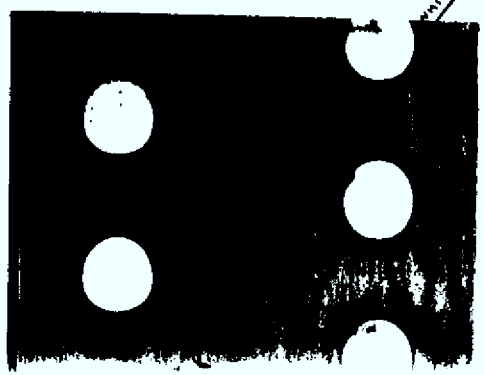
LEGEND

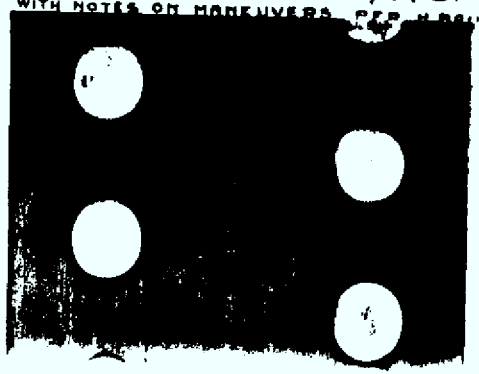
X--- POSITION AT WHICH GAS WAS VALVED
⑨--- " " " WATER BALLAST WAS DROPPED
⊠--- " " " ENGINE SPEED & ROTATION CHA
d--- " " " YAW LINES WERE DROPP
α--- AIRSHIP'S ANGLE OF ATTACK, INCLINATION, + UP BY THE BOW
ALT-- " ALTITUDE, METERS ABOVE SEA LEVEL

TRACK OF AIRSHIP HINDENBURG OVER LAKEHURST, N.J.-6 MAY 1937

WITH NOTES ON MANEUVERS, PER H. BAUER 2ND OFFICER

O. LOESER ZOP





936 Raymond-Commerce Building
Newark, New Jersey

August 13, 1937.

Commander C. E. Rosendahl
United States Naval Air Station
Lakehurst, New Jersey

Re: AIRSHIP HINDENBURG
Government Reservation
Matter.

Dear Commander Rosendahl:

I am in receipt of your letter of August 12, 1937 and an enclosing a letter stamped "Chicago, Illinois, May 7" in connection with the above matter.

I desire to thank you for forwarding this, and it will receive proper consideration.

With best wishes, I am

Very truly yours,

R. E. VETTERLI,
Special Agent in Charge

REV:CSC
Enc. (1)
cc-Bureau
70-15

_____1937.

____The Director
____Mr. Nathan
____Mr. Tolson
____Mr. Quinn
____Mr. Clegg
____Mr. Foxworth

____Files Section
____Personnel Files
____Chief Clerk's Office
____Identification Division
____Technical Laboratory
____Mechanical Section

SUPERVISORS

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____Mr. Chambers
____Mr. Chipman
____Mr. Collier
____Mr. Cornelius

____Mr. Drayton
____Mr. Leckie
____Mr. McDade
____Mr. McIntire
____Mr. Mertz

____Mr. Pennington
____Mr. Ranstad
____Mr. Rosen
____Mr. Spear
____Mr. Vogel

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 9-16-88 BY SP1A-CGM

____Miss Gandy
____Mr. Ward
____Mr. Parsons
____Mrs. Morton
____Miss Coe
____Miss Conlon
____Typists - 5724

____See Me
____Send File
____Call me regarding this
____Correct
____Note and Return
____Search, serialize and route
____Stenographers - 5730

Note the attached Kindaberg file

E. A. TAMM - 5738.

6248190-NR(3)

FEDERAL BUREAU OF INVESTIGATION

_____ 1937.

____The Director	✓ Files Section
____Mr. Nathan	____Personnel Files
____Mr. Tolson	____Chief Clerk's Office
____Mr. Quinn	____Identification Division
____Mr. Clegg	____Technical Laboratory
____Mr. Foxworth	____Mechanical Section

SUPERVISORS

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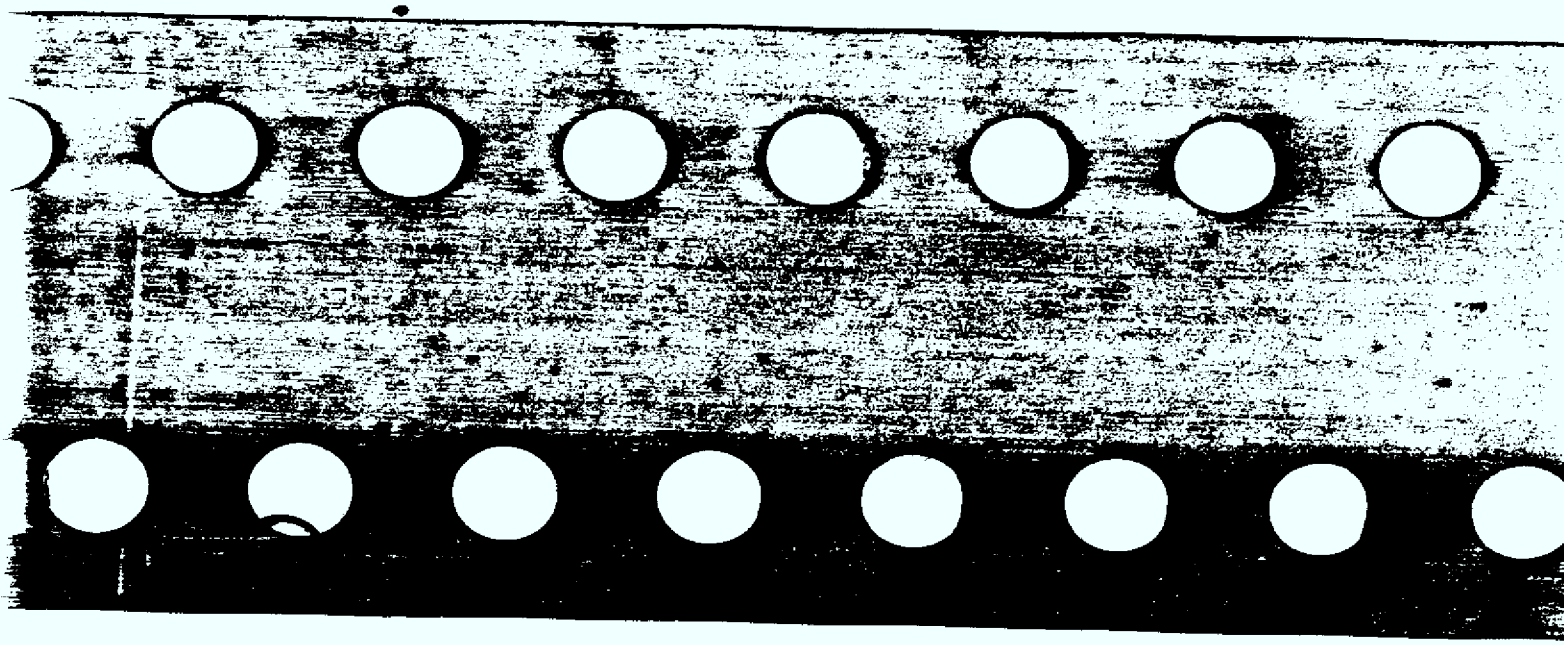
____Mr. Chipman	____Mr. McDade	____Mr. Spear
____Mr. Collier	____Mr. McIntire	____Mr. Vogel
____Mr. Drayton	____Mr. Pennington	____Mr. Wyly

____Miss Gandy	____See Me
____Mrs. Fisher	____Send File
____Mrs. Morton	____Call me regarding this
____Mr. Ward	____Correct
____Mr. Parsons	____Note and Return
____Miss Conlon	____Search, serialize and route
____Typists - 5257	____Stenographers - 5730

Please do
exam
62-48190

E. A. TAMM - 5738.

THE HINDENBURG WAS DESTROYED BY A CLOCK WORK TIME FIRE BOMB. THIS WAS ALL PLANNED WEEKS BEFORE. THE PURPOSE TO OBTAIN HELIUM. IT WAS NOT INTENTIONED TO DESTROY PASSENGERS BY IT BUT BECAUSE OF 2 HOURS DELAY TO MAKE MOORING PLAN WAS UPSET. HAD MOORING BEEN ON RIGHT TIME ALL BUT 3 or 4 OF CREW ALSO ALL PASSENGERS AWAY AND MAYBE NO LIVES LOST AT ALL. LEHMAN PLACED BOMB AFT 4.30-5 o'CLOCK P.M. TIME TO GO ABOUT 7 P.M. NO OTHER ON SHIP KNEW OF BOMB OR THE PLAN. ECKNER DID. HE HAD GOT BERLIN O.K. SOME OF AFT FLAMES SHOWED COLOR CHEMICAL USED. PERHAPS METAL NEAR STERN NOW WILL SHOW DIFFERENT HEAT FLAME MARKS WHERE LEHMAN SET BOMB, NOT SURE BUT WORTH LOOKING FOR. ECKNER SAID WOULD HAVE HELIUM SURE, SAID THIS LAST FEB. DONT LET HIM.



NEW YORK, N.Y. MAY 28 1230 PM 1937 STA 2

INVESTIGATION BUREAU
U.S. DEPT OF JUSTICE
NEW YORK
N.Y.

9-16-84

Federal Bureau of Investigation

United States Department of Justice

936 Raymond-Commerce Building,
Newark, N. J.

TJD:MN
70-15

November 29, 1937

Director,
Federal Bureau of Investigation,
Washington, D. C.

RE: DESTRUCTION OF AIRSHIP "HINDENBURG"
GOVERNMENT RESERVATION MATTER

Dear Sir:

A review of this file reveals there is no investigation to be conducted at this time and that the investigation conducted by the other interested governmental agencies including that of Commander C. E. Rosendahl of the U. S. Naval Air Station at Lakehurst, New Jersey, is dormant.

It is noted that there are numerous memoranda included in the file of this division, which contain various details of the investigation conducted at Lakehurst, N. J. Same have not been included in a report. The information contained in these memoranda is of a miscellaneous nature and is not believed to be of informative value to the Bureau. Therefore, same is not being included in a report, as it would necessitate considerable clerical work.

Unless instructions are received to the contrary from the Bureau, this case is being considered closed.

Very truly yours,

T. J. Donegan

T. J. DONEGAN,
Special Agent in Charge

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
9-10-78 SP1A

cc- Washington Field

RECORDED
INDEXED

RCV:TD

62-48190 - 53 December 21, 1937

RECORDED

Special Agent in Charge,
Newark, New Jersey.

Re: DESTRUCTION OF AIRSHIP
"HINDENBURG" -
Government Reservation Matter.

Dear Sir:

Reference is made to your letter dated November 29, 1937, relative to the above captioned case, advising that there are numerous memoranda included in your file containing various details of the investigation conducted at Lakehurst, New Jersey.

Inasmuch as the Bureau is not in possession of the information contained in the memoranda referred to above, you are requested to summarize the information contained therein, submitting the same to the Bureau so that it will be available in the event inquiries are subsequently made relative to this case.

Very truly yours,

John Edgar Hoover,
Director.

JOHN EDGAR HOOVER
DIRECTOR

Federal Bureau of Investigation
United States Department of Justice
Washington, D. C.

62-48190
RCV:TD

December 17, 1937

MEMORANDUM FOR Mr. TAMM

Re: Destruction of Airship "Hindenburg"; Government Reservation Matter.

With reference to the above captioned matter, you will recall that on the evening of May 6, 1936 the Airship "Hindenburg" exploded in midair at Lakehurst, New Jersey as it was attempting to land on its initial trip for the year 1937 from Germany and was completely demolished.

Thereafter certain investigation was performed by the Bureau at the reque t of Commander C. E. Rosendahl, of the Naval Air Station at Lakehurst, New Jersey, particularly as to one Joseph Spaeh who was a passenger on the Hindenburg. The information developed concerning Spaeh was subsequently transmitted to Mr. South Trimble, Jr., Solicitor, Department of Commerce, Washington, D.C.

A printed copy of a report prepared by South Trimble, Jr. concerning investigation of the Hindenburg disaster is in the Bureau file, setting out theories as to the cause of the accident. The conclusion in Trimble's report, however, is to the effect that the cause of the accident was the ignition of a mixture of free hydrogen and air and that the theory that a brush discharge ignited such mixture appears most probable.

In the absence of instructions to the contrary, the Newark Office is closing its file. You will observe, however, from the attached letter that the Newark Office has been requested to summarize information contained in numerous memoranda included in the Newark file which has not heretofore been furnished the Bureau.

Respectfully,

R.C. Vogel

R.C. Vogel

62-48190-54

RECORDED & INDEXED

DEC 21 1937

CONTAINED IN FILE

9-16-88 SP1A66m

TAMM

February 21, 1938

RCV:LL

62-48190

Special Agent in Charge,
Newark, New Jersey.

Re: DESTRUCTION OF AIRSHIP
"HINDENBURG" -
Government Reservation Matter.

Dear Sir:

Reference is made to my letter dated December 21, 1937, concerning the above cautioned matter.

Your attention is called to the request for a summary of the information contained in numerous memoranda included in your file, which information has not previously been furnished to the Bureau.

Very truly yours,

John Edgar Hoover,
Director.

Form No. 8

THIS CASE ORIGINATED AT NEWARK, NEW JERSEY

Newark FILE No. 70-15

REPORT MADE AT:	DATE WHEN MADE:	PERIOD FOR WHICH MADE:	REPORT MADE BY:
NEWARK, NEW JERSEY	2-24-38	1-14-38	J. E. DALEY (A)

TITLE:	CHARACTER OF CASE:
DESTRUCTION OF AIRSHIP "HINDENBURG"	GOVERNMENT RESERVATION MATTER

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 7-16-88 BY SP1 [illegible]

X SUMMARY REPORT

The following summary report was prepared in accordance with Bureau request. Since there will not be any prosecution, no witnesses will be set out, and the summarization will be confined to a recital of the facts as related in the Newark Field Division File, in narrative form.

The German airship "Hindenburg", carrying a crew of 61 persons, and 36 passengers, departed from Frankfort, Germany, on May 3, 1937, on its initial trip for that year, to the United States. It was originally scheduled to arrive at the Naval Air Station, Lakehurst, New Jersey, at 6 a.m. on May 6, 1937, but due to strong head winds which retarded its progress during the course of its journey, it radioed the station that it would arrive about 6 p.m. on May 6, 1937. Between the hours of 5:40 p.m. to 4:45 p.m. on the afternoon of its scheduled arrival, there had been heavy showers and thunder. The Hindenburg arrived over the airport between five and six p.m., but at 5:45 p.m. the Naval Station sent a message to the ship that conditions were unsettled, and recommended that it should not land until further advised. At 6:12 p.m. the Station sent a message that conditions were considered favorable for landing, and that a ground crew of ninety-two Navy personnel and 139 civilians were ready to receive the ship. There was thunder over the Station at the time. The ceiling was about three thousand feet, with visibility of about five miles.

Commander C. E. ROSENDAHL, in charge of the Naval Air Station at Lakehurst, New Jersey, described the landing of the ship in the following manner:

DO NOT WRITE IN THESE SPACES

APPROVED AND FORWARDED:	RECORDED AND INDEXED:
J. E. Donegan — SPECIAL AGENT IN CHARGE	87-11-8190-56 FEB 28 1

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2 - Newark

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The airship approached the airport at about 6:25 p.m., Eastern Standard Time, (7:25 p.m. Eastern Daylight Saving Time), and made a sharp turn to the starboard, which was not unusual. In Commander Rosendahl's opinion, the approach was normal for a ship inflated with hydrogen, and the crew utilized the backing power of the engines to check the approach of the ship, which is customary. The men in the ground crew had been instructed in groups, under their respective leaders, as to the handling of the ship on the ground. The crew on the airship dropped the landing ropes from the bow of the ship and they were immediately connected to the ground lines. These lines were used to draw the ship into position for attaching the steel landing cable which is drawn into the mooring mast. The approach was made at an elevation of 200 feet or less. Commander Rosendahl was located at the mooring mast and gave the necessary instructions as to the handling of the ground crew at this point. He indicated that the wind blew to the westward when the ship reached the surface, and he believed the conditions were satisfactory in general, and they were proceeding in a normal manner to land the ship. About four minutes after the control ropes had connected with the ground, and while the mooring cable was being lowered but had not, as yet, reached the ground, certain events occurred which changed the normal landing procedure.

The nose of the ship was about 50 feet from the circular track, which is 671 feet from the mooring mast. The ship never got any closer to the mooring mast than this point. Commander Rosendahl indicated that at this time he saw a small burst of flame on the top of the ship, towards the stern, and, in his opinion, this indicated to him the doom of the ship. Immediately, the entire stern took fire, and after this initial burst of flame the fire progressed forward. He said he expected more in the way of an explosion than was apparent, although he had never seen an airship inflated with hydrogen burn. There were several mild explosions and the ship was generally consumed by fire. Commander Rosendahl indicated that he had no knowledge of the origin of the fire. After that, the stern of the ship continued to come down, and thereafter the front portion settled to the ground at a moderate rate of descent.

Commander Rosendahl ran from the vicinity and commanded the ground crew to do likewise in order to avoid being caught under the ship as it fell. When the ship settled, the ground crew immed-

iately returned to effect the possible rescue of the injured. They immediately arranged for the necessary fire-fighting apparatus, using chemicals for this purpose. There was no water line in the immediate vicinity of the mooring mast and this necessitated the laying of considerable hose to reach it. The wounded were immediately removed and taken to the hospital, until the available space was exhausted. A guard was immediately established to prevent anything being stolen from the ship.

Of the 97 persons on board, 39 members of the crew and 24 of the passengers, survived. Twelve passengers and 22 members of the crew met their death at that time, and one member of the ground crew was burned and subsequently died, on May 6, 1937.

The airship was in the command of Captain ERNEST LEHMANN, who was one of the crew who met death in this tragedy.

At approximately 8 p.m. on the evening of May 6, 1937, Special Agent in Charge W. S. Devereaux was telephonically informed by Assistant Special Agent in Charge T. J. Donegan, of the New York Field Division, to the effect that former Special Agent in Charge E. L. Richmond, who was convalescing at his home, had heard a press dispatch given over the radio at approximately 7:40 p.m. to the effect that the Airship Hindenburg had exploded and had been completely demolished at Lakehurst, New Jersey, as it was attempting to land on its initial trip for the year 1937, from Germany.

Based upon this information, a telephone call was placed to the Bureau by Acting Special Agent in Charge W. S. Devereaux, who contacted Mr. P. E. Foxworth. Mr. Foxworth was informed that the news of the crash had been received and, inasmuch as the Naval Air Base at Lakehurst, New Jersey, was a Government Reservation, Acting Special Agent in Charge Devereaux and Inspector E. J. Connelley were proceeding immediately to Lakehurst in an effort to ascertain whether or not the facts involved would constitute a situation that would be a crime over which the Bureau had investigative jurisdiction.

Shortly after midnight on the night of May 6-7, 1937, the facts concerning the disaster were conveyed to Mr. Foxworth by telephone by Acting Special Agent in Charge Devereaux.

On the afternoon of May 7, 1937, Acting Special Agent in Charge Devereaux received a telephone call from Assistant Director Clyde Tolson, who informed Mr. Devereaux that he was of the opinion

that Acting Special Agent in Charge Devereaux, in company with either Inspector E. J. Connelley or Special Agent in Charge R. E. Vetterli, should proceed to Lakehurst, New Jersey, and inform the Naval authorities that they were acting only in the capacity of observers and that the Bureau was taking no active part in the inquest in so far as investigative activities were concerned at that time.

Almost immediately after the destruction of the Hindenburg, there was organized a Board of Inquiry of the Department of Commerce under the direction of Mr. South Trimble, Jr., Chairman, and Major R. W. Schroeder. This Board conducted daily oral hearings at the United States Naval Airport Station at Lakehurst, New Jersey between May 10, 1937, and May 28, 1937. An investigation was also conducted by a Senatorial Committee, under the supervision of United States Senator Royal S. Copeland, but under the immediate direction of Roger Williamson and Lieutenant Colonel Harold E. Hartney.

During the investigation conducted by the above, the Bureau offered to co-operate with the Inspectors of the Department of Commerce in their investigation. Agents of the Bureau were present at the daily hearings conducted by the Board of Inquiry in the capacity of observers.

On May 8, 1937, Lieutenant Colonel Harold E. Hartney and Inspector Williamson of the United States Senate Committee advised that they had found tracks of two men leading over a back fence of the Reservation along the road about 1,000 feet onto the Reservation, and they had photographed these tracks. They attached some significance to these foot tracks and indicated that possibly the tracks of these two men were those of persons who might have had something to do with the destruction of the Hindenburg, if a sabotage angle was to be considered. Bureau Agents photographed these foot tracks, as well as making plaster of Paris casts of them, but subsequent developments indicated that these tracks were only those of persons who had tried to be in a better position to witness the landing of the Hindenburg than would have been possible had they remained outside of the enclosure of the Reservation with the thousands of other people who gathered to view the landing of the ship.

The hearings conducted by the Board of Inquiry of the Department of Commerce began on May 10, 1937. At these hearings, various Naval employees constituting the ground crew at the Lakehurst Naval Air Station, members of the crew of the Hindenburg, and pas-

sengers of the ship, testified. In general, the members of the crew testified that the trip across the ocean was entirely satisfactory and normal in every respect, and that they knew nothing concerning the accident until they saw the reflection of flames, accompanied by a detonation. These hearings furnished no information to the effect that sabotage was responsible for the destruction of the Hindenburg.

On May 14, 1937, the Board of Inquiry representing the Department of Commerce, was joined by a German Commission which had been invited to sit in on the hearings. This German Commission was composed of Dr. Hugo Eckener; Dr. Ludwig Duerr, Chief Construction Engineer of the German Zeppelin Transport Company; Dr. Guenther Bock, Professor of Aerodynamics at the Charlottenburg Technicological Institute; Professor Max Deickmann, Radio Expert; Walter Hoffman, of the National Research Bureau; and Lieutenant Colonel Joachim Breithaupt, of the German Air Ministry.

On the evening of May 18, 1937, a telephone call was received from Commander C. E. Rosendahl of the Naval Air Station in Lakehurst, New Jersey, to the effect that he desired to confer personally with Special Agent in Charge R. S. Devereaux on the morning of May 19, 1937, inasmuch as he was in possession of certain information that he did not care to discuss over the telephone.

On the morning of May 19, 1937, Special Agent in Charge Devereaux and Special Agent Lee F. Malone contacted Commander Rosendahl who advised that he was a personal friend of Hugo Eckener, the German Airship Technician, and that Eckener had stated to him on numerous occasions that the first opinion he had formed of the disaster was that her wreckage was caused by sabotage; further, that he now knew that he had made a mistake in expressing such an opinion to the journalistic fraternity in Germany; and to remedy this mistake he had made a statement to the press in this country that he did not feel that sabotage could possibly have been the cause of the disaster. However, according to Commander Rosendahl, Eckener stated to him that he was convinced that the airship had met her ill-timed fate through the employment of sabotage on the part of either Communists or sympathizers with the Anti-Nazi movement. Commander Rosendahl, on this occasion, also informed that he had always entertained the sabotage theory as being a logical cause for the destruction of the Hindenburg and this opinion had gradually grown until, at the time of the interview, he was also confident that there had been sabotage present in connection with the destruction of the ship. He advised that on May 18, 1937, Helmut Lau, a member of the

German crew, who was serving in the capacity of helmsman, as well as Rudolf Sauter, who held the position of Chief Engineer, had stated at the time of the catastrophe they were occupying positions in the stern of the ship and they were located near the lower rudder.

According to their testimony, the first evidence that they had that anything was wrong on board the Hindenburg was when they noticed a glow that appeared in the gas shaft that separates gas cells #4 and #5. They testified, further, that immediately after the appearance of this glow, which reminded them of a Japanese lantern, the entire section of cells #4 and #5 seemed to burst, and immediately flames enveloped the entire stern.

This is the first testimony that was given before the Board of Inquiry that had shown a definite origin for the fire, and this, therefore, placed the fire as definitely beginning in the gas shaft located between cells #4 and #5.

There are sixteen gas cells in the superstructure of the airship. Each cell is filled with hydrogen gas, and through the use of this hydrogen gas the airship obtains its lifting power. For the airship to lose altitude, it is necessary that this hydrogen gas be valved off so that the airship may gain weight and lose some of its buoyancy. In order to valve off this gas, there is located in each gas chamber what is called a maneuvering valve, as well as an automatic value. The automatic valve is a valve that is more or less of a safety device and operates only as a result of pressure within the gas chamber, as, for instance, in the event the gas cell becomes too full of hydrogen, the safety device will then function, and enough gas will be valved off through the automatic valve so that the gas within the gas cell will again be maintained at its normal pressure. The maneuvering valve is the valve that is operated by the operator of the ship to cause the ship to lose altitude, and the maneuvering valve is controlled by apparatus which is located in the control car. The position of both the maneuvering valve and the automatic value is conveniently located along what is called the axial girder, upon which is placed the axial catwalk. This axial catwalk runs the entire length of the superstructure of the ship.

When the gas is valved off through the gas shaft, it proceeds upward into the air through the shaft, which is covered by what is called the shaft hood. Commander Rosendahl explained that the shaft is open to the air at the top of the superstructure of the Hindenburg, and naturally there is air in the shaft itself. He also ex-

plained that hydrogen is a gas that, when mixed with air, is highly inflammable, and, mixed with a sufficient quantity of air, is highly explosive. In further explanation, he stated that 99% hydrogen mixed with 1% of air will constitute an inflammable mixture. However, if the ratio of hydrogen is increased to 80%, and 20% air, there is still a highly explosive mixture. If the content of the gas cells is reduced to 20% hydrogen and 80% air, it still constitutes a highly explosive mixture.

Therefore, Commander Rosendahl stated, as soon as hydrogen is valved off into the gas shaft, there is a mixture of hydrogen and air in the internal part of the superstructure of the Hindenburg and there is a certain area in which these two elements are permitted to mix before they are carried off into the air through the gas vent. Commander Rosendahl stated that it is true that this mixture of air and gas in the gas shaft or vent could have been ignited by static electricity that might have been generated by the clothing of a person on board, rubbing of two objects in the superstructure, by friction, or any type of vibration in the immediate vicinity of the gas shaft.

Commander Rosendahl stated, however, that he was of the opinion--due to various happenings that had been called to his attention--that there was a strong possibility that the fire which was ignited in this gas shaft at 62 ring, was caused by an individual who attempted to perform an act of sabotage. In connection therewith, Commander Rosendahl stated that Dr. Eckener had personally interviewed every member of the German crew, since his arrival in the United States. He stated that the members of the crew naturally talked more freely to Eckener in private than they had to the Board of Inquiry at the public hearings. According to information that Eckener had received from members of the crew, the rule that a passenger was not to be allowed out of the passenger quarters unless accompanied by a member of the crew, was not strictly enforced in the case of a passenger by the name of Joseph Spach. According to Commander Rosendahl, various members of the crew informed Eckener that the passenger, Joseph Spach, had two dogs that were maintained in the freight room, necessitating Spach's entrance into prohibited territory in order to tend to these dogs at frequent intervals, and frequently Spach was not accompanied by an officer of the crew on his visits to care for the dogs.

Eckener also related to Commander Rosendahl that one of the students who has since returned to Germany, mentioned the fact

75

that Joseph Spach appeared to him to be unsympathetic to airship travel and impressed him as being a peculiar type of passenger; also, that this person remained aloof from the other passengers and was not at all, in his opinion, responsive to the explanation of the crew regarding the various technicalities of the airship itself. Commander Rosendahl advised that the only information he had on Joseph Spach there at Lakehurst was to the effect that he was supposedly a United States citizen, using an American passport, and that he had been treated at the Fitkin Memorial Hospital at Asbury Park, New Jersey, immediately after the accident.

Special Agent Lee F. Malone conducted an investigation relative to the character of Joseph Spach, who resided at 240-16 Alameda Avenue, Douglaston, Long Island, New York. A neighborhood investigation revealed that Spach was considered by all who knew him, to bear an excellent reputation.

Numerous people have written to the Board of Inquiry of the Department of Commerce, expressing their views as to the cause of the disaster to the Hindenburg. An examination of these letters reveals that 30% of them gave mechanical reasons for the destruction; 50% attributed the destruction to static igniting the hydrogen gas; and 20% considered the cause of the disaster to be sabotage. The entire investigation by the Board of Inquiry of the Department of Commerce, however, revealed no direct evidence that there was sabotage in connection with the destruction of the ship, and the definite cause for its destruction was never really ascertained.

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74