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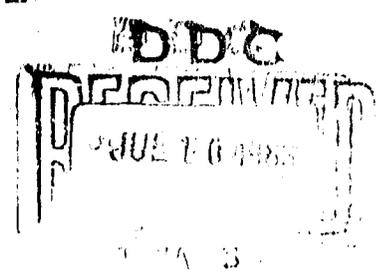
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AMERICAN AND SOVIET INTEREST IN AIRSHIPS

L. S. Hill



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PREFACE

The purpose of this Memorandum is to summarize some recent expressions of interest in lighter-than-air craft. In particular, certain Soviet recognition of the potential value of the airship as an economical means for carrying bulky cargo is emphasized.

This Memorandum should be of interest to those Air Force Personnel charged with the responsibility for development of methods and equipment for transporting oversized items. Such facilities must have size and/or weight capabilities considerably exceeding those of current aircraft, yet remain free from highway, underpass, bridge, and tunnel limitations.

This Memorandum should also be of interest to those within the Air Force concerned with the determination of new concepts or new and useful applications for existing concepts. Operational planners in other Governmental agencies and contractual establishments may also find this Memorandum of interest.

SUMMARY

The first part of this Memorandum deals with two recent Izvestia publications on lighter-than-air craft. One is a report of an interview with the head of a newly established Soviet Project and Technical Bureau of Airship Construction in Moscow. The other consists of comments by Soviet officials on the first publication.

Both articles accentuate the disclosure that the Soviets for the first time have at their disposal a sufficient quantity of helium for airship operations. To this can be attributed a revived interest in airship construction in the Soviet Union today.

Possible savings to the Soviet economy, attributable to lighter-than-air craft, are strongly stressed in the articles. The large-lift capability of the airship for transport of cargo is the first consideration, although some other possible applications are noted. Recent advances in other technologies, notably material, engines, and navigation, are interpreted as opening new vistas in the lighter-than-air field.

The first article presents a statement by the head of the Moscow Airship Bureau observing that there is no logical objection to the renewal of airship construction in the USSR. The second publication announces that not one of the letters received from readers of varied backgrounds denies the "necessity of a speedy revival of airship construction." The article concludes with the editor's surmise that the subject "launched" by Izvestia is on the point of "passing out of the realm of wishes and proposals into that of actual fact." It is well to recognize that the first article could be the result of an effort by lighter-than-air experts to engender support for airship construction. In addition, the airship bureaus in the Soviet Union at time of the publications appeared to occupy rather unorthodox positions in the Soviet government.

The last section of this Memorandum reviews briefly some current American interest and activity in operational airships. The indication is that at present there is no widespread interest in lighter-than-air craft in this country and that airship activity, for all practical purposes, is nil.

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I. INTRODUCTION

It has been written that National security depends upon many factors: the morale of a country's soldiers ... the number and ingenuity of its scientists ... its geographic position ... and even the prevailing winds that blow across its expanses. National security depends also upon economic factors.* New inventions pose the stark reality of upsetting the military status quo and shifting the course of the economic battle. New uses for old concepts can contribute to the same end.

In this Memorandum, note is taken of Izvestia's pronouncements of interest in lighter-than-air craft. The airship -- a controversial and often maligned invention -- thus comes under possible consideration by the Soviets to help lift that country out of its economic quagmire. This, intrinsically, has national security implications. But the airship of itself also has possibilities for direct use as a weapon of war or most assuredly in the conduct of warfare.

*Hitch, C. J. and R. N. McKean, The Economics of Defense in the Nuclear Age, The RAND Corporation, R-346, March 1960.

II. USSR ACTIVITY

Izvestia reported on October 10, 1962, that a special office -- the Project and Technical Bureau of Airship Construction -- has been established in Moscow to study the use of airships as an economical means of carrying bulky cargo.* An airship can travel at a speed almost four times as fast as a contemporary seagoing vessel and faster than a truck.** If the Soviets were to develop successfully a fleet of modern airships, it is possible that these could be used advantageously for the following military specifications: (1) prime movers for boosters; (2) vehicles for mass movement of troops and materiel; (3) mobile command posts; and (4) airborne missile launchers. Head of the USSR Bureau of Airship Construction, Engineer Feodor F. Assberg, was recently interviewed by Izvestia correspondent, V. Byelotserkovski. The interview sheds some light on present Russian activity and interest in the lighter-than-air field.

At the time of the report, the design Bureau was occupied in working out the technical, economic, and operational data for a rigid airship (dirigible) to transport complete ovens weighing several tons.*** According to the Izvestia report, these now have to be cut into sections for transport by rail and then re-assembled and welded together. Even so, according to the Soviet article, it is necessary to remove power lines along the rail right-of-way and to limit traffic to one direction during transport. Cement ovens, the Russians claim, are by no means the only awkward objects which cost almost more to transport than to manufacture.

*The Soviet Bureau of Airship Construction, also referred to by various other designations -- perhaps due to translation -- apparently originated in a "Commission on Lighter-than-Air Navigation" formed in 1957 by the Leningrad branch of the Geographic Society of the Academy of Sciences of the USSR. "Branch" commissions were also established in several Soviet cities.

**For example, approximately ten days were required to ship the bathyscaph, Trieste, by water to the East coast from San Diego, California, to be pressed into service to probe for the sunken submarine, Thresher. Two to three weeks are required for many booster deliveries from the West Coast to point of use.

***While exact specifications of the Soviet ovens were not stated,

The Soviet study was initiated at the request of Gosstroi (the State Department for Buildings). The Bureau of Airship Construction has been in existence for about a year, having been established by the All-Union Geographical Society.*

Byelotserkovski, the Izvestia reporter, began his interview with a question which appears to have a universal fascination for those who have given little thought to lighter-than-air potential: "Surely airships have outlived their era, haven't they?" Assberg countered with another question:

Would you describe as 'obsolete' a means of conveyance which is capable of picking up, shall we say, a turbine weighing 40 to 50 tons from the Leningrad factory where it has been manufactured and tested and conveying it direct to some site where it is needed, perhaps in the middle of Siberia?***

The laying of oil and gas pipelines and electrical power cables, and the transport of physicians with fully equipped operating rooms were among potential uses mentioned. Possible employment of airships for communications relays was also noted.

The Soviet engineer also stated: "In contrast to all other countries, in our country zeppelins are simply a necessity. Nowhere are there regions so hard of access as those that we have here."***

in April, 1963, the Permanente Cement Company announced installation of a 520-ft long rotary cement kiln in the Lucerne Valley of California. Largest in the Western U.S.A., the new kiln is about 16 ft in diameter. According to the Great Soviet Encyclopaedia, "contemporary cement ovens are up to 170 meters long and have a diameter up to 4.5 meters," which closely approximate the dimensions of the Permanente kiln.

*The Soviet Geographical Society seems to be an unusual sponsor for this type of activity. One conjecture might be that the Bureau has secured a small research grant from Gosstroi as its sole support.

**Admiral C. E. Rosendahl once noted during a discussion with the author that newspapers and radio are still with us, despite the advent of television. Later in this Memorandum, excerpts from an address by a NASA employee are included in which barges, now used for booster transport, are described as considered obsolete 4000 years ago.

***This statement is obviously not entirely true. For example, there are other inaccessible areas in Asia as well as in Africa and the Americas.

COST AND OPERATIONAL CONSIDERATIONS

The Izvestia report emphasizes advantages of the great lifting capacity and radius of action of the airship. Considered of commensurate importance by the Soviet study group is economy of operations.*

Since an airship is sustained by the lift of the gas in it, considerably less engine-power is required than for a corresponding heavier-than-air vehicle. The Soviet engineer said:

If we take as unity the cost of transporting one ton over one kilometer by airplane, then the figure for its transport by helicopter is 5.65, but its transport by airship is only 0.33. And this is without allowance for the fact that an airship does not require an aerodrome, and that it can be kept almost continuously in service, because its maintenance and running repairs can be carried out while it is flying.

Another important consideration in air transport is weather. The Russian engineer, who is a veteran airship designer according to the Izvestia release, regards as an additional advantage the "all-weather serviceability of the airship." His statement in this respect during the interview was:

The present-day airship can face any kind of weather, as, for instance, in the winter of 1958, when there was a gale of unprecedented force off the coast of New England which forced ships to seek shelter and kept airplanes confined to their hangars, the Coast Guard (sic) patrol airships kept on patrol up to 200 miles out to sea without suffering any accident. Winds of gale force, especially if accompanied by thunderstorms, do, of course, interfere with an airship's landing, but this difficulty can be easily avoided, as an airship is capable of riding out a gale by simply heaving-to in the air, like a ship on the sea.

*For an analysis of resource allocation vis-a-vis national defense considerations see Fisher, G. H., What is Resource Analysis?, The RAND Corporation, P-2688, January 1963.

This is a fairly reasonable description of a ten-day all-weather evaluation of the airship conducted by the U. S. Navy. The wording is, in fact, very much in keeping with the official report. The inference, however, that an airship can ride out a gale "like a ship on the sea" is a most optimistic deduction from the test results. Moreover, the test was conducted using a non-rigid airship, the blimp, whereas the present Russian interest is in the rigid airship.

It was noted in the interview that costly hangars for housing the airship are no longer required. The claim was made that modern synthetic materials can stand up to any atmospheric conditions, and so far as wind is concerned, all that is needed is a mooring mast around which the airship can swing, like a weathercock. The Soviet engineer stated further that if the airship were caught by a storm while grounded at a location where there is no mooring mast, then "all she need do is to take off for the time being, as a ship in an open anchorage does in similar circumstances."

The Soviet designer said: "There is no logical objection to the renewal of airship construction in the USSR." On this statement he elaborated when he said:

It (airship construction) was arrested in 1938, and with good reason, because at that time dirigibles were unreliable and dangerous to run, owing to our lack of adequate supplies of helium, of efficient radio-aids to navigation, and materials for making strong, light, gas-proof envelopes. We have got all of these now, so it is high time that airship construction had its proper rights restored.

According to Admiral C. E. Rosendahl, one past difficulty in the production of helium in the Soviet Union was a means for transporting it out of the Urals. Apparently the Soviets have now broken the helium barrier and can enjoy the attendant benefits. In this connection, the Izvestia report explicitly stated that since the pre-war

days of the German Zeppelin and the Akron, airship operations have been made "very much easier by the development of strong light alloys and plastic materials, of reliable and powerful engines, of electronic aids to navigation and especially the availability of helium to replace hydrogen, the 'Achilles heel' of lighter-than-air aircraft."

CARAVANS OF AERIAL GIANTS

Another Izvestia report on airships appeared on December 20, 1962. The article began with a letter from a group of Soviet scientists headed by Professor J. Hakkel, who in 1933-34 was a member of the "Chelushkin" Arctic expedition and is now a leading Polar expert.

Having read the first article, these scientists wrote:

The Polar scientists of the Arctic and Antarctic Institute for Science and Exploration are of the opinion that a revival of airship construction is a work of prime necessity. Without dwelling upon the advantages to our national economy promised by dirigibles, we would like to mention the need of them for exploring the limitless wastes of the Arctic and Antarctic. To observe the points at which the pack-ice breaks up, to disembark scientists at any given spot, to carry large quantities of heavy materials, to land freely where an airplane could not find space: these are some of the problems to be resolved for which an airship would be useful.

The letter went on to say that present exploration is limited to a narrow strip along the line of march. The belief was expressed that the explorers' task would be much cheaper and easier if an airship were available.

The possible impact of airships on Soviet industry is illustrated in a reported statement of Nikudin, a veteran engineer in the production department of the "Giprocement" Institute, and of Shiamin, the head specialist of the technical department of the same firm: "There is not one single branch of industry in which the use of airships would not have a good effect, economically speaking. Even in a single year, the continual transport by land of cooking stoves with very heavy installation bases, in sections, costs several million rubles."

It was suggested that the use of airships for carrying rotary kilns had been costed out with most attractive results. It was also hinted here that the plan is to carry "enlarged sections" of kilns rather than whole kilns, which would move the dimensions of the cargo closer to those of large boosters.

The unique position of the airship in the context of the Soviet geography and present economic status was described by the constructor Krasnovski when he said: "We are spending a great deal of money in building roads and canals, but we forget that caravans of goods can travel not only by river, canal, and railway, but also through the air. And for this last, it is unnecessary to build dams, lay down railway lines, construct aerodromes and harbors."

The Izvestia publication also noted that K. E. Tsiolkovski, for whom the former Tsiolkovski Institute of Airship Construction in Moscow was named, once said:

Build a dirigible of silver, and it will give you a 100 per cent profit on the capital outlay; build one of pure gold, and it will still give a reasonable margin of profit.

According to the second Izvestia report, an office similar to the Moscow Airship Bureau, referred to as the Planning and Technical Office for Dirigibles, was opened in Leningrad by the Geographical Society of the USSR. Location is in the technical cabinet of the Vasilostrovski section of the Communist Party.

The position of the second design bureau -- in a Precinct Committee (Raikon) of the Leningrad Communist Party -- is most unorthodox. This, together with the Geographical Society affiliation, suggests that the project at this date had no strong governmental standing.

Izvestia concluded in a "self-congratulatory" note by indicating that its initiative in printing the first article has been received with great interest by the Ministry of Transport and Construction, the USSR Academy of Construction and Architecture, and several other institutions. The assumption was expressed by the editor that the subject "launched by Izvestia" is on the point of "passing out of the realm of wishes and proposals into that of actual fact."

III. U. S. ACTIVITY

In view of current Soviet interest in the airship field, it is interesting to review briefly present U.S. activity in this area. The availability of helium has not been a problem in this country. For all practical purposes, however, American progress in lighter-than-air technology ceased in the early 1930's when the last new design of non-rigid airships was completed. The Navy discontinued its lighter-than-air mission in 1962.*

Admiral Burke stated before the House Subcommittee on Appropriations for 1962 in April, 1961, that lighter-than-air craft "can do a very fine job where there is not any enemy opposition." In the same Hearing, Congressman Flood reminded Admiral Burke that the "ASW people think the blimp is a great idea." Admiral Burke agreed with his statement, but then replied that the Navy needed "people and M. & O. dollars" for the operation. "And," he continued, "we are going to have to cut other things than lighter-than-air to get them."

SPACE AGE USES

NASA has apparently taken no "official" stand on the use of lighter-than-air craft for booster transport. However, in an address before the Wingfoot Society in October, 1962, Mr. K. R. Stehling, Scientist, Office of Plans and Evaluation, NASA, said:

* A 157-ft long blimp to be used for advertising and public service operations is now under construction in the U.S. with a possibility that another ship will be built here for similar use in Europe. A highly experimental rigid airship, the Aereon III, is now being constructed and tested in Trenton, New Jersey, by private interests.

NASA centers are still interested in (airship) transport of empty liquid rocket stages. Presently, however, they are being planned to be shipped by barge. Not long ago, I read a book that mentioned all the facts that had been dug from the early Egyptian monuments, and they quoted a little piece from Phouros II or III, a pharaoh of the third dynasty (about 2000 BC) who complained about barge shipping and said it was old fashioned. This was 4000 years ago that barges were obsolete, and we're still using them. Air shipments may be the only practical way, particularly if we have to make quick launches at Cape Canaveral in sequence for rendezvous firings, but it is not yet an official NASA or Defense Department policy to use it.*

Mr. Stehling also noted that the use of airships for rescue has been discussed. In this regard he stated, "If the use of a blimp were offered to an agency which has a re-entering astronaut, I am sure it would be used."

The NASA employee also described another application for lighter-than-air. Noting that planetary landings are very much in the plans, he said that the important question is what the men can do when they get to a planet. One possibility, suggested by several companies, is the use of a small airship. A corresponding heavier-than-air craft could be much more complicated and difficult to use, particularly since the exact composition of the atmosphere is not known.

OTHER INTEREST

German know-how and experience in the rigid airship field is still a principal source today. However, some records were destroyed during World War II, and others were carried off by French occupation forces. A new American organization, HI&A, comprised of experts in

*Another impetus for an alternate means of booster conveyance is the vulnerability of the Panama Canal area. Barges are also susceptible to "roadblock," caused by accidents, such as the collapse of a lock in the Tennessee River in 1961. Absence of shock and vibration is also an advantage claimed for the airship.

the design, construction, and operation of rigid airships is endeavoring to acquire from the German Zeppelin Company, the Luftschiffbau Zeppelin (BmbH) Friedrichshafen am Bodensee, a B, Germany (LZ), all remaining plans, drawings, bill of material calculations, test reports, and other data. Luftschiffbau Zeppelin is the only company in the world to successfully design, construct, and operate a fleet of rigid airships. Also, an attempt is being made to secure remaining documents pertaining to the operation of Zeppelin-type airships from an associate, the Deutsche Zeppelin Reederei (DZR).*

*A renewed West German interest in passenger-airships has also been reported. This, like the Soviet activity, has been instigated by a new source of helium -- Canada. Two airships built by the West Germans now utilize hydrogen, forbidden for passenger use.

Reports from Europe note that Canadian Helium Ltd. has been approached by Klaus Pruss, son of the late Captain Max Pruss, former skipper of the airship Hindenburg. Captain Pruss contended trans-Atlantic airship travel would return in the nuclear age. A 300-passenger nuclear-powered airship was reported under design in 1958.

IV. CONCLUDING REMARKS

No articles on airships have been noticed in the Soviet press since the second publication. Dr. Oleg Hoeffding of The RAND Corporation, who contributed some other items to this Memorandum, believes that this might mean the "campaign" has bogged down, or that more appropriate bureaucratic wheels have started to grind on the idea, or that the subject has become classified, perhaps because of the interest displayed by "other agencies."

Be that as it may, a major interest in airships has existed within the Soviet Union for some time despite the dearth of helium in the past. The Russians claim that during the 1930's they conducted the world's only Balloon Academy. Airship engineers and pilots were trained in the academy. At least six Soviet books on lighter-than-air craft have been published. At one time, according to Admiral Rosendahl, the Soviets expressed an interest in purchase of the USS Los Angeles and also offered to buy the wreck of the Hindenburg while it was still smoldering.

In contradistinction to present Soviet activity, there is much less contemporary concern with lighter-than-air craft in the U. S. The only real interest appears to be in the self-initiated efforts of a small number of individuals.