1. Al-1 Habbakuks (Floating Airdromes for Asia Theatre): September 1 - 9, 1943.
MEMORANDUM FOR THE PRESIDENT

Subject: HAEBAKUKS.

           (b) Comments on Reference (a) sponsored by Mr. Churchill.
           (c) Supplementary Report by Ad Hoc Committee dated 9 September.

Enclosures: Copies of References (b) and (c).

1. At Mr. Churchill's request, I went to the White House on Wednesday, September 8 at noon, and received from him reference (b) after some discussion of the points raised therein. Upon my return to the Navy Department about 12:20, I orally reconvened the Ad Hoc Committee to deal with reference (b), and submit herewith their supplementary report - reference (c).

E. J. King
R. J. King
HARRAXUKS

Comments on Report of Ad Hoc Committee.

(a) Technical Considerations.

Inadequate examination has been given to the Navy pontoon proposal. The Navy pontoon flight platform assembly is taken as a continuous rigid platform. It is perfectly possible in a number of ways to use the pontoons as floats to support a flying platform, thus employing from half to a quarter the number of pontoons here specified.

(b) It has apparently not been realized that the flight platforms were to be used only in water sheltered from swell by promontories or islands, as is quite feasible in the operations envisaged.

(c) It is stated that the pontoons would be inoperable in moderate seas. No notice appears to have been taken of the proposal to use wave-blocking devices, which was the essence of the Prime Minister's original idea.

(d) No mention is made of the possible high mobility of pontoon assemblies if fitted into suitable carrying ships. Even if a method of using fewer pontoons is not developed, it
is admitted that it could be ready by April 1st with highest priority. It would not require the highest priority to have it ready if say one-third of the number of pontoons were required, and it could not be claimed that this would interfere in any substantial way with existing production schedules.

(e) The use of concrete caissons has been thoroughly studied by the British Admiralty. The type proposed seems very similar to those considered by them and rejected on the grounds that the conditions of waves specified are far too gentle to permit of any ocean towage. The minimum specified by the Admiralty were of waves 28 feet high and 500 feet long, which a pontoon as described here could not be expected to stand. The whole value of the floating pontoon method is that reliance is placed on using a relatively flat water surface as support, and assembling on the spot. Structures of strength between this and a full-scale HARRAKUK capable of standing ocean storm conditions will always be uneconomical.
Further Comments on Report.

Re Paragraph 4.

Date envisaged for the operation and for the return of carriers for U.S. operations does not fit in with existing plans. The requirement is effectively for May and delivery at the base by April should be sufficient. The return of borrowed carriers to U.S. for operations in May would be of no value for plans at their present stage.

Re Paragraph 5.

The question of length of flight deck for different types of moored carriers has been very carefully gone into in England. The length accepted for HABBANUK I with Arrester gear was 1,250 feet. It would not seem technically impossible to fix Arrester gear on to floating airfields, but in any case the length proposed of 1,500 feet would seem to be adequate in view of the fact that the planes would have a very good run-up over level water??

Re Paragraph 6.

The number of planes operable from such a field was also very carefully considered in England. The Fleet Air Arm authorities maintain that as many as 180 planes could be
operated from the considerably smaller strip 1,200 feet by 200 feet proposed for HABBAKUK I. It would seem that the number 50 could be considerably improved if special attention were given to studying the operational problems involved.

Re Paragraph 7.

Air Commodore Lydford and Captain John are available for information on the flying possibilities.
Conclusions.

Re Paragraph 10.

While it is true as stated that it would be difficult to get platforms available before April 1944, it should be possible to make them available from that date onwards, which is when the operations are envisaged.

Re Paragraph 11.

There seems to be a serious misapprehension at this point. British authorities consider that aircraft operations should be possible in this area for a considerable period of each month throughout the year.

Re Paragraph 12.

Elements of surprise could be attained if the pontoon assemblies could be packed as indicated in Annex C of my Note of September 4th. In fact greater surprise might be achieved here than by the use of more conventional and easily-recognizable types such as aircraft carriers.

While it is not maintained that the case for the use of floating airfields as against carriers has been made out, it would seem that the reasons given for their rejection overlook a number of points and would deserve reconsideration.

September 8th, 1943.
MEMORANDUM TO ADMIRAL KING:

Subject: HABRAKUES, Report of Ad Hoc Committee.

In accordance with your instructions, the Ad Hoc Committee was reconvened and in consultation with Professor Bernal reconsidered its previous report on HABRAKUES, having due regard to the effect of change in date and location of the prospective operation.
9 September 1943.

Subject: NARRAKUS.

Supplementary Report by Ad Hoc Committee.

THE PROBLEM.

1. To reconsider previous report of Ad Hoc Committee regarding the use of NARRAKUS.

FACTS BEARING ON THE PROBLEM, AND CONCLUSIONS.

2. Careful reconsideration of all phases of the problem leads to the conclusions that while the extension of time and the presumed improved operating conditions at a more southerly site would facilitate the use of other means of providing flight platforms, the advantage of using carriers in this instance still remains preponderant.

3. Consideration was given to the fact that, in any movement to the site in contemplation, it is essential that the expedition be provided with carrier protection prior to arrival at the site and until the establishment of flight strips and other services required for the support of local air operations. The logical scheme of operations would be to provide air protection by carrier for the expedition up to and including the time when one or more flight strips could be established on land, at which time the carriers could be relieved for other service. The surety of operations provided by this sequence of operations is considered greater than for any of the other proposed schemes.

4. The Committee gave consideration to the various comments on the previous report of the Committee and these were discussed in detail with Professor Bernal. It appears that such substantial differences as exist between the views expressed in the Committee's previous report and those contained in the comments by Professor Bernal arise primarily from the change in location and time of the proposed action.
Subject: HARRAKUQS
Supplementary Report by Ad Hoc Committee - Cont'd

5. The Committee desires to record its views that under certain conditions the use of floating flight strips might have considerable advantages, and for this reason the Committee believes that energetic measures should be continued to develop practicable working designs and to make necessary tests to demonstrate their feasibility with a view to the training of special crews for the handling of such strips. Until such designs have been made and the crews trained, the Committee believes that it would be unwise to place reliance for the success of an important operation on untried measures which will require the diversion of personnel, materiel, and shipping essential from other approved operations.

6. In summary, the Committee is of the opinion that carriers should be relied upon for the establishment of beachheads and flight strips on shore necessary for this operation; the numbers, types and disposition of the carriers to be determined by the C.O.S.

John S. McCain

Ben Moreell

O. C. Badger
APPENDIX A.

With reference to Paragraphs (a), (b) and (c), Page 1: The Navy pontoon flight platform is feasible, provided the water is smooth. The wave blocking device, if successful in trial, should be useful in keeping the surface dry and assist in maintaining the steadiness of the platform.

With reference to Paragraph (d), Page 1: The carrying of pontoons in reasonable assemblies would require not less than 36 ships. The packing of the pontoons in the holds of ships for assembly at the scene of action would require a minimum of 19 ships but would require a correspondingly greater time for assembly. The design of a special lighter pontoon equipment and ships to carry it might reduce this number, but the necessary preparation and trials would involve time-consuming design and would take too much time in design tests to meet the required date.

With reference to Paragraph (e), Page 2: Concrete caissons may be built to tow in sections and put together at the scene of action, but if made into rigid structures it would take as long as it would to carve out a strip on the beach.

Page 3, Paragraph 4: No comment.

Paragraph 5: The practicability of arresting gear on a pontoon landing strip or a concrete barge landing strip must be studied further before an opinion can be given.

In re Paragraph 6: Four different agencies, each containing officers who have had operating experience at the front, have estimated from a minimum of 32 to a maximum of 50 planes operable from such a strip.
Paragraph 10: Would require a corresponding reduction of pontoon equipment now needed for other approved operations.

In re Paragraph 11: British authorities are correct with reference to weather off the coast of Sumatra.

In re Paragraph 12: From 19 to 36 ships will be required to carry or tow landing strip assemblies. There will be many troop ships with the expedition. A surface fleet will be required to protect the expedition from submarine and surface attack. A fleet of such size can not proceed at a greater estimated speed than 10 knots, and hence will surely be discovered on the third day out and will therefore be subjected to air attack. A sufficient number of carrier-based aircraft must be provided to protect the expedition and to insure air superiority. It is a simple and logical move to extend this carrier-based air protection until a landing strip is completed and land-based planes installed.
Comments on Report of Ad Hoc Committee.

(a) **Technical Considerations.**

Inadequate examination has been given to the Navy pontoon proposal. The Navy pontoon flight platform assembly is taken as a continuous rigid platform. It is perfectly possible in a number of ways to use the pontoons as floats to support a flying platform, thus employing from half to a quarter the number of pontoons here specified.

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it would seem that the reasons given for their rejection overlook a number of points and would deserve reconsideration.

September 8th, 1943.
MEMORANDUM TO ADMIRAL KING:

Subject: HABBAKUKS, Report of Ad Hoc Committee.

In accordance with your instructions, the Ad Hoc Committee was reconvened and in consultation with Professor Bernal reconsidered its previous report on HABBAKUKS, having due regard to the effect of change in date and location of the prospective operation.

[Signature]

ENC. (Ref. c) - No. 1
SECRET

9 September 1943.

Subject: HABRAKUKS.

Supplementary Report by Ad Hoc Committee.

THE PROBLEM.

1. To reconsider previous report of Ad Hoc Committee regarding the use of HABRAKUKS.

FACTS BEARING ON THE PROBLEM, AND CONCLUSIONS:

2. Careful reconsideration of all phases of the problem leads to the conclusion that while the extension of time and the presumed improved operating conditions at a more southerly site would facilitate the use of other means of providing flight platforms, the advantage of using carriers in this instance still remains preponderant.

3. Consideration was given to the fact that, in any movement to the site in contemplation, it is essential that the expedition be provided with carrier protection prior to arrival at the site and until the establishment of flight strips and other services required for the support of local air operations. The logical scheme of operations would be to provide air protection by carrier for the expedition up to and including the time when one or more flight strips could be established on land, at which time the carriers could be relieved for other service. The value of operations provided by this sequence of operations is considered greater than for any of the other proposed schemes.

4. The Committee gave consideration to the various comments on the previous report of the Committee and these were discussed in detail with Professor Bernal. It appears that such substantial differences as exist between the views expressed in the Committee’s previous report and those contained in the comments by Professor Bernal arise primarily from the change in location and time of the proposed action.
5. The Committee desires to record its views that under certain conditions the use of floating flight strips might have considerable advantages, and for this reason the Committee believes that energetic measures should be continued to develop practicable working designs and to make necessary tests to demonstrate their feasibility with a view to the training of special crews for the handling of such strips. Until such designs have been made and the crews trained, the Committee believes that it would be unwise to place reliance for the success of an important operation on untried measures which will require the diversion of personnel, materiel, and shipping essential from other approved operations.

6. In summary, the Committee is of the opinion that carriers should be relied upon for the establishment of beachheads and flight strips on shore necessary for this operation; the numbers, types and disposition of the carriers to be determined by the C.C.S.
APPENDIX A.

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Memorandum for Admiral King:


1. The report of the Ad Hoc Committee appointed to investigate into the practicability and feasibility of providing floating seadromes or the equivalent thereof for certain operations in southeast Asia, is submitted herewith.

2. Recommendations of this committee are:

   (a) That the British provide by target date, 1 February 1944, the CVE's necessary for this operation.

   (b) That, in case the British are unable to provide and man the necessary number of CVE's by the target date, 1 February 1944, an over-riding priority be assigned to eight British escort carriers scheduled for completion prior to 15 December 1943, and that these be manned, and equipped with necessary air squadrons, by the United States.

   (c) That, in the latter case, and after the operation immediately contemplated, these carriers be employed, United States manned, to support operations in the Pacific scheduled for the late spring 1944, upon completion of which they would be taken over, manned, and operated by the British.

   (d) That, to determine the practicability and effectiveness of the use of HARRAKUK's, one concrete barge HARRAKUK be constructed by the British in India or elsewhere for trial.

John S. McCain
Ben Morell
E.A. Grady
HARRAKUFS
Report by Ad Hoc Committee

THE PROBLEM

1. To submit recommendations to the Commander in Chief, United States Fleet, and Chief of Naval Operations, regarding the use of HARRAKUFS or alternate means to provide adequate air coverage for certain contemplated operations with emphasis placed on the element of surprise in the early establishment of local air superiority.

FACTS BEARING ON THE PROBLEM

2. The Ad Hoc Committee has considered various schemes for quick establishment and operation of floating fighter strips at any selected point. These schemes include:

   a. The Armstrong aerodrome;
   b. Assemblies of standard Navy pontoons;
   c. Assemblies of hull sections of sectional floating drydocks;
   d. Platforms built over and supported by an assembly of LST's;
   e. Assemblies of concrete caissons; and
   f. The employment and availability of carriers and escort carriers.

3. The result of these investigations is set forth in the table, Enclosure (A). The feasibility of operating aircraft from these structures is included therein.

4. The only scheme within the bounds of possibility of use by 1 February 1944 involves the use of carriers. The only additional scheme that comes within the bounds of possibility of use by 1 April 1944 involves the use of large assemblies of Navy pontoons. The latter scheme is not considered practicable for reasons set forth in Enclosure (A). Material required could be made available only at the cost of delaying other programs essential to the success of approved operations.
5. The Prime Minister expressed a desire for a floating landing strip 1,400 feet long and 176 feet wide. He later amended this width to 225 feet. He indicated his intention to operate fighters (Spitfires) designed for land, and not carrier, operations. British air authorities consider such a landing strip insufficient in length for the operation of Spitfires, and state that a length of 1,800 feet is necessary. United States air authorities estimate that 2,200 feet is necessary for safe operation.

6. Patterns to scale indicate that 92 Spitfire 5's or 98 Spitfire 9's can be serviced on a strip 2,200 feet by 225 feet. However, for operation under combat conditions, 40 planes is a desirable number, and in no event can more than 50 be satisfactorily operated under combat conditions.

7. In the area designated for the operation of this floating landing strip, weather conditions preclude planned aircraft operations from mid-April until November, because of heavy rains and prevalent storms. Planned aircraft operations are practicable in this area during the winter months.

8. British CVE's will be completed in the near future on the dates as indicated:

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Yard</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Speaker</td>
<td>Willamette</td>
<td>9/20/43</td>
</tr>
<tr>
<td>42</td>
<td>Premier</td>
<td>Commercial</td>
<td>11/3/43</td>
</tr>
<tr>
<td>43</td>
<td>Shah</td>
<td>Seattle-Tac</td>
<td>9/27/43</td>
</tr>
<tr>
<td>44</td>
<td>Patroller</td>
<td></td>
<td>10/11/43</td>
</tr>
<tr>
<td>45</td>
<td>Rajah</td>
<td>Willamette</td>
<td>12/23/43</td>
</tr>
<tr>
<td>46</td>
<td>Ranee</td>
<td>Seattle-Tac</td>
<td>10/25/43</td>
</tr>
<tr>
<td>47</td>
<td>Trouncer</td>
<td></td>
<td>1/15/44</td>
</tr>
<tr>
<td>48</td>
<td>Thane</td>
<td>Seattle-Tac</td>
<td>11/8/43</td>
</tr>
<tr>
<td>49</td>
<td>Queen</td>
<td></td>
<td>11/25/43</td>
</tr>
<tr>
<td>50</td>
<td>Ruler</td>
<td></td>
<td>12/5/43</td>
</tr>
<tr>
<td>51</td>
<td>Arbiter</td>
<td></td>
<td>12/20/43</td>
</tr>
<tr>
<td>52</td>
<td>Smiter</td>
<td></td>
<td>1/3/44</td>
</tr>
<tr>
<td>53</td>
<td>Puncher</td>
<td></td>
<td>1/17/44</td>
</tr>
<tr>
<td>54</td>
<td>Reaper</td>
<td></td>
<td>1/31/44</td>
</tr>
</tbody>
</table>

9. Ten CVE's will be able to operate a total of 300 fighter planes, which is better than twice the operating capacity of any three HARRAUKS considered above, and provides for multiplicity of flight decks, increased mobility and efficiency of servicing aircraft.
CONCLUSIONS

10. That the only feasible method of providing surprise air coverage from sea-borne aircraft platforms prior to mid-April 1944 is by the use of carriers or auxiliary carriers.

11. That from mid-April until November 1944 no planned aircraft operations from sea-borne aircraft platforms are practicable in the specified area.

12. The element of surprise is not feasible by the use of any of the various barge assemblages considered above because of the slow towing speed and approach to the area of operations by the large number of ships and tugs required, the resulting probability of detection by enemy scouting forces, and the vulnerability of all of these schemes to bombs, gunfire, and torpedo.

RECOMMENDATIONS

13. That the British provide by target date, 1 February 1944, the CVE's necessary for this operation.

14. That, in case the British are unable to provide and man the necessary number of CVE's by the target date, 1 February 1944, an over-riding priority be assigned to eight British escort carriers scheduled for completion prior to 15 December 1943, and that these be manned, and equipped with necessary air squadrons, by the United States.

15. That, in the latter case, and after the operation immediately contemplated, these carriers be employed, United States manned, to support operations in the Pacific scheduled for the late spring 1944, upon completion of which they would be taken over, manned, and operated by the British.

16. That, to determine the practicability and effectiveness of the use of HARRAUK's, one concrete barge HARRAUK be constructed by the British in India or elsewhere for trial.
SECRET

From: Commander in Chief, U.S. Fleet, and Chief of Naval Operations.
To: The President.
Subject: Examination of Special HABBAKUKS as directed on Friday, 3 Sept. 1943.
Enclosure: Report of Ad hoc Committee on subject (2 copies).

1. I transmit herewith - as Enclosures - the report of the ad hoc Committee appointed on Friday 3 September 1943 at a meeting in the White House with the President and Mr. Churchill.

2. A copy is enclosed for your reference to Mr. Churchill.

3. I concur in the recommendations of the Committee.

[Signature]
E. J. King
<table>
<thead>
<tr>
<th>CHARACTERISTIC</th>
<th>ADEQUATE DESIGN</th>
<th>RAFT PORTALS</th>
<th>SEE NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESCRIPTION</td>
<td>Unsatisfactory. Cannot be provided in time available either (a) or (b). 3 years time of construction.</td>
<td>Satisfactory. Cannot be set. Schedule (b) can be met with revolving priority.</td>
<td>Unsatisfactory. Cannot be set. Time required to build a new raft here is extremely doubtful.</td>
</tr>
<tr>
<td>CAPACITY IN OPERATING PLACES</td>
<td>Adequate, if made of specified size.</td>
<td>Adequate, if made of specified size.</td>
<td>Adequate, if made of specified size.</td>
</tr>
<tr>
<td>CAPABILITY OF MEASUREMENT IN OPERATING CONDITION</td>
<td>Fair. Might fall structurally due to bombing.</td>
<td>Fairly good. Postures highly resistant to damage and easily repaired.</td>
<td>Fairly good. Postures highly resistant to damage and easily repaired.</td>
</tr>
<tr>
<td>DIFFICULTY OF PRODUCTION DISPOSITION OF PLATE</td>
<td>Poor. Requires complete protection and does not provide a sufficient amount of time.</td>
<td>Fair. Base dimensions of plates because of thickness and difficulties of postures.</td>
<td>Fair. Base dimensions of plates because of thickness and difficulties of postures.</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>Poor. Requires moving as an complete unit, with very poor tow characteristics.</td>
<td>Fair. Requires classiﬁcation and towing of parts.</td>
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</tr>
<tr>
<td>AVAILABILITY FOR LATER USE</td>
<td>Poor.</td>
<td>Poor.</td>
<td>Poor.</td>
</tr>
<tr>
<td>ADEQUATE DESIGN FOR PLACES AND PERSONNEL</td>
<td>Poor. Requires tend to</td>
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<td>Poor. Requires classification and towing of parts.</td>
</tr>
</tbody>
</table>

This scheme would be completed in 30 months. In the event of any serious delay, the project could be completed in 30 months. The scheme is for an estimated 200,000 tons of steel. A rough estimate of 30,000 tons is 100 months. The scheme is to be completed in 30 months.
FLIGHT PLATFORM
TARGET DATE AT SITE
(G) FEB. 1, 1944
(L) APR. 1, 1944

<table>
<thead>
<tr>
<th>DATE DUE</th>
<th>LIFT CAUSING</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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- **FLIGHT PLATFORM**
  - Target Date at Site: (G) FEB. 1, 1944
  - Target Date at Site: (L) APR. 1, 1944

- **Blank Page**
  - Image contains multiple sections related to flight platform specifications, likely including lifting capacities and structural considerations.
  - Further information available in the text.

- **Regraded Unclassified**
  - Document appears to discuss flight platform specifications.
  - Further details may be available upon closer examination.
U. S. SECRET
BRITISH MOST SECRET
648-3
(C.O.S. 315/2)
29 August 1943

COMBINED CHIEFS OF STAFF

"HABBAKUKS"
Reference: C.O.S. 112th Mtg.,
Item 3.
The Combined Chiefs of Staff have taken note of paragraphs a, b and c below, which were presented by the United States Chiefs of Staff in C.C.S. 315/1. They have agreed to the provisions of paragraph d below.

a. By the expenditure of extraordinary effort and subsequent stoppage of other essential war projects, the construction of HABBAKUK II and an erecting plant therefor is feasible and might be completed as early as the end of 1945.

b. Construction of HABBAKUK III could possibly be accomplished by the end of 1945. Claims for invulnerability of HABBAKUK III to hull damage may be somewhat justified, but they are outweighed by the operating advantages inherent in conventional carrier types by virtue of speed, maneuverability, and operating refinements.

c. Due to the relatively small value of the HABBAKUKS in increasing the effectiveness of aircraft operation, and in view of the existing aircraft carrier program, the diversion of manpower and critical materials involved in their construction is not warranted.

d. The Combined Chiefs of Staff agree to the construction of a section of HABBAKUK II, the continuation of design, and the study of the construction and of the facilities
necessary for a full-size ship. They have further agreed that the appropriate United States, British, and Canadian authorities should be invited to set up a board forthwith to press on with the action agreed to above and to report progress monthly to the Combined Chiefs of Staff.

H. REDMAN,
J. R. DEANE,
Combined Secretariat.
MEMORANDUM
FROM CHIEF OF BUREAU

To: Admiral Nelson Brown

Hereewith Joint letter by
Budechs and Buships on
Habkaluk designs.

Complete information on
Habkalukhs is contained in
(PPS 3/5/2) dated 29
August 1943.

The recommendation
of the Joint Staff planters
is contained in Memo.
9 20 August. to US Joint
Chief of Staff.

I assume you can
obtain these documents.
We are making a
BUREAU OF YARDS AND DOCKS
MEMORANDUM
FROM CHIEF OF BUREAU

To: ..................................................

Search for all available data on floating air-dromes.

As far as we have received, no directive to take any positive action toward accomplishing any of the Habba-kuk projects — Ben Moreell
JOINT LETTER

From: Chief of the Bureau of Yards and Docks.
Chief of the Bureau of Ships.

To: Vice Chief of Naval Operations.

Subj: Habbakuk Designs.

1. The signatory Bureaus were requested informally on 13 August to submit within two days a technical study of the practicability of Habbakuk schemes I, II, and III, submitted by the Joint Planning Staff. The complexity of the problem is such that it is not practicable to prepare a complete and detailed technical analysis of the structures within this time, particularly in view of the almost total lack of detailed technical information on the respective schemes. The comments submitted below are therefore general in character and based upon the more or less fragmentary information available.

2. The Habbakuk program in essence contemplates floating airdromes for various types of air operation, differing from aircraft carriers primarily in their greater size and limited mobility. The three types described as of wood, pyroset and composite steel and wood construction, respectively, may therefore be considered as variants of one single problem. The large size of such airdromes would permit improved protection against sinking by virtue of their greater subdivision and the possible development of improved protective systems. Such airdromes would, however, be subject to increased probability of damage to the flight deck and exposed aircraft by bomb attack because of the extremely limited mobility and enormous size of the target. This disadvantage could be overcome only by the increased use of fighter planes and by extensive anti-aircraft defense.

3. It can be stated definitely that the construction of airdromes of these general characteristics is possible. Whether such construction is practicable would have to be determined by intensive investigation of the many technical problems involved. Even if the practicability
is taken for granted, the detailed engineering development of the project would involve a vast amount of pioneering design and probably a considerable amount of original research. Preparation of working drawings, development of construction plants and organization and the solution of the construction problems, particularly with respect to selection of site, determination of launching methods and provision of access to deep water are all matters which would require considerable time for their solution. It seems apparent that the time required to develop and execute this project has been underestimated in the reports available to the Bureaus and it is considered that structures of this type could not possibly be completed and commissioned within many months after the dates estimated there in.

4. Regardless of the material selected for the hull structure, a very considerable quantity of highly critical material would be required for the main machinery and other mechanical installations, equipment and fittings of such air-dromes. The diversion of such critical materials would necessarily interfere appreciably with other programs essential to the prosecution of the war. If the Habbakuk project were authorized, decision would have to be made as to the other programs to be correspondingly curtailed or sacrificed.

5. Habbakuk I

This project contemplates a wood vessel having a length of 1500 feet, a breadth of 250 feet and a speed of two to four knots in tow. No wood structure of comparable size subjected to the stresses incident to high seas operation has ever been constructed or designed. Great difficulties are anticipated in providing connections of adequate strength for the stresses developed by wave motion or by towing. There is at present an extreme shortage of heavy timber in this country and Canada and the material which is available is of extremely poor quality and unseasoned. Experience in other structures has indicated serious maintenance difficulties resulting from the use of the types of wood now available. Wood construction presents serious fire hazards, particularly in conjunction with gasoline and explosives, which would only be partially offset by fireproofing. It is doubtful whether sufficient capacity exists for fireproofing the quantities of wood involved. The requirement that this structure be towed presents a serious military handicap since it involves either the continuous diversion of a considerable number of large vessels for maintaining headway, or anchorage in relatively shallow protected waters with increased exposure to attack.

6. Habbakuk II

This scheme contemplates a self-propelled air-drome from 1700 to 2200 feet long developing a speed of about seven knots and constructed of pycrote,
a mixture of pulp and water frozen during construction and maintaining its integrity by continuous artificial refrigeration. The Bureaus consider that it is fundamentally unsound to utilize a material which is dependent on the continuous operation of mechanical equipment for its structural integrity and durability and consider that this scheme is prima facie beyond the realm of practicability, both as regards construction and operation.

7. Habbakuk III

This scheme contemplates a seadrome of composite steel and timber construction from 1000 to 1200 feet long and self-propelled, developing a speed of about twelve knots. No description of the proposed composite construction is available and it is not clear whether the combination is developed for strength or whether the wood is used primarily as packing to provide inherent buoyancy. This scheme most nearly approaches conventional construction and would involve the least amount of pioneering design, development and research. It is considered to be the most practicable of the three schemes submitted. It is noted, however, that the United States Joint Planning Staff has recommended that this scheme be eliminated from further consideration as a weapon for use by the United States.

8. Each of the three schemes presented for consideration is based on a specific type of hull construction. It appears to the Bureaus that the material found best suited for one hull might easily be applicable also to any other hull in the size range under consideration. Moreover, there are other possibilities worthy of consideration both for hull material and for the basic type of hull construction. For example, the use of reinforced concrete could be studied, or some other material might be found which would have some of the properties of pycrete but would be inherently durable without refrigeration. Similarly an entirely different type of hull structure, such as that proposed for the Armstrong Seadrome, might offer a solution.

9. In any case the desired basic military characteristics -- approximate size, speed, endurance, plane complement, armament, protection -- would have to be established. It would then be technically possible to arrive at a solution which would meet any reasonable combination of characteristics within the approximate range under consideration in the Habbakuk schemes. This design would then permit a firm estimate of the productive effort involved in time, labor and materials. Such an estimate would, of course, have an influence on the determination of the justifiability of building one or more of these craft.

10. Summarizing, the Bureaus consider that

(a) Habbakuk I and II, of materials as proposed, are not
acceptable solutions to the problem of designing a large floating air-drome.

(b) Habbakuk III appears to be feasible along the general lines proposed, but insufficient information has been furnished to permit a firm technical evaluation of this scheme. Extensive engineering development would be necessary even for this, the simplest of the three schemes.

(c) The design, construction and operation of a large floating air-drome, within the range described but with adequate materials, is technically possible.

(d) The design and construction of any floating air-drome would present many technical difficulties, which although not insuperable, would require considerable time and large-scale effort for solution.

(e) The construction of even one large floating air-drome would divert appreciable quantities of critical materials from some other part of the war program. The material diversion for additional craft of such type would soon accumulate to significant proportions.

(f) No scheme of the general character under consideration offers sufficient certainty of early development and completion to warrant its inclusion in present strategic planning for any specific date.

11. Finally, the Bureaus recommend that no further development of the specific schemes designed as Habbakuk I, II, and III be undertaken, for the reasons stated above, and that no other floating air-drome of these general characteristics be undertaken unless the military value of such a project is found to be greater than indicated by the surveys so far made, and of sufficient importance to warrant corresponding sacrifice in other parts of the war program.

/s/ B. Moreell
Chief Bureau Yards & Docks.

/s/ E.L. COCHRANE
CHIEF OF BUREAU OF SHIPS.