DOCUMENT HISTORY OF WS 117L
(1946 TO REDEFINITION)

HISTORY OFFICE
CHIEF OF STAFF
SPACE AND MISSILE SYSTEMS ORGANIZATION
AIR FORCE SYSTEMS COMMAND
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VOLUME II

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7. List of RAND Reports dated 1 Feb 47.


10. Report, Project RAND Proposed Type Specification for an Experimental Satellite, RA-15031, title page and introduction only, 1 Feb 47.


12. Ltr (C), TSIBOW, BrigGen Alden R. Crawford to CoFS, USAF, subj: Project RAND, Satellite Vehicle, 8 Dec 47.

13. Memo (C), LtGen H. A. Craig to VCoFS, subj: Earth Satellite Vehicle, 12 Jan 48, w/l Incl, Statement of Policy for a Satellite Vehicle, signed Gen Hoyt S. Vandenberg, VCoFS, USAF.

14. Ltr (C), MajGen L. C. Craigie, to CG, AMC, subj: Satellite Vehicles, 16 Jan 48, w/o Incl.

32. AMC Regulation 11-14, Administrative Practices, Work Priorities for USAF Logistical Support Tasks, 6 Apr 54.


34. FDD No. 1115, 14 Sep 54; Amendment No. 2, 2 Aug 55.

35. Memo, WDTF, Col Charles H. Terhune, Jr., to Col Sheppard, subj: Proposed Visit of Majors Green and Riepe, WADC Project Officers for 1500-Mile Tactical Missile and Satellite, Respectively, to WDD, 3 Nov 54.

36. Msg, Comdr WADC to WDD, 031700Z Nov 54.

37. SR No. 5, 29 Nov 54; Amendment No. 1, 8 Aug 55.

38. DF, WSCG to WCAPP, subj: Project Nickname, 14 Dec 54; Comment No. 2, 17 Dec 54.

39. History, Project 1115 Background, 31 Dec 54.

40. Memo, WDTF, LtCol Otto J. Glasser, for Col Terhune, subj: Lockheed General Consulting Study, 3 Feb 55.

41. Ltr, WDD, BrigGen B. A. Schriever, to LtGen D. L. Putt, 4 Feb 55.


43. GOR No. 80 (SA-2e) (C), subj: General Operational Requirement for a Strategic Reconnaissance Satellite Weapon System (C), 16 Mar 55.

44. Memo, Sibyl Kent to Col Terhune, (Re visit by Col Genes), 16 Mar 55.

45. Memo, WDD, for Gen Power, subj: Redstone - Scientific Satellite, 30 Mar 55.

46. Ltr, BrigGen B. A. Schriever to MajGen S. R. Harris, Comdr, ARDC, no, subj: 1 Apr 55.

47. Memo (S), WDD, BrigGen B. A. Schriever to Col Terhune, subj: Satellite Development Plan, 15 Apr 55.


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49. Memo, WDG, LtCol B. L. Beasman for Col Terhune, subj: Staff Meeting, 9 May 1955, 6 May 55.

50. Memo for General Schriever from Capt Babcock, subj: Item for Staff Meeting, 9 May 55.

51. Memo, WDG, for Dr. Remo, subj: Scientific Satellite, 10 Jun 55.


53. Memo, WDGX, Col Harold W. Norton, for Gen Schriever, subj: Satellite Presentation, 8 Jul 55.


55. Minutes of Staff Meeting, WDG, 21 Jul 55.


57. Memo, WDG, BrigGen Schriever, for Col Terhune, subj: Scientific Satellite, 22 Aug 55.


59. MFR, LtCol Frederic C. Oder, subj: Telephone Conversation with Colonel Genex, 9 Sep 55.

60. Msg, Comdr WDD to Comdr ARDC, 192300Z Sep 55.

61. Msg, Comdr WDD to Comdr ARDC, 192330 Sep 55.


63. DF, RDGB to WDD, subj: Weekly Diary Items, 26 Sep 55.

64. Memo, WDGX, BrigGen B. A. Schriever, for Col Terhune, subj: Additional Tasks Assigned to the Remo-Wooldridge Corporation, 3 Oct 55.

65. Memo, WDGX/LtCol C. E. Hughes, for Col Terhune, subj: Status of Action Taken to Fund the R-W Contract Over-run, 7 Oct 55.

67. DF, WDGR to WDD, Subj: RDGR Weekly Diary Items, 10 Oct 55.

68. ARDC System Requirement No. 5 (c), 17 Oct 55.

69. DF, WDGR to WDD, subj: RDGR Weekly Diary Items, 19 Oct 55.

70. Memo, WDGR/Col Harold W. Morton, to Col Terhune, subj: Miscellaneous Events, 20 Oct 55.


72. Minutes of Staff Meeting, WDD, 26 Oct 55.

73. Msg, Comdr WDD to Comdr Holloman AFB, 031800Z Nov 55.


75. Ltr, ARDC to BrigGen Bernard A. Schriever, Comdr WDD, no subj: 7 Nov 55.

76. DF, RDGR to WDD, subj: RDGR Weekly Diary Items, 14 Nov 55.

77. Memo, WDGT/NAVY/Comdr R. C. Truxx, to Col Norton, no subj; 14 Nov 55.


79. Memo, LtCol B. L. Boatsman to Col Oder, no subj, 23 Nov 55.

80. Msg, Comdr, Dr of Sys Men Hq ARDC WPAFB Ohio to Comdr WDD, 261539Z Nov 55.

81. DF, RDGR to WDD, subj: Diary for Week Ending 10 Dec 55, 12 Dec 55.

82. Memo (c), USN Comdr R. C. Truxx, for Gen Schriever, subj: Program for Execution of WDD Responsibilities with Respect to Pied Piper Project, 16 Dec 55, w/1 Incl: Draft ltr to RCA, Martin and Lockheed.

83. Memo, WDG/MajGen B. A. Schriever, for Colonel Terhune and Dr. Remo, no subj, 15 Dec 55.

85. Msg, Comdr WDD to Comdr, Directorate of Systems Management, Det No. 1, ARDC, Wright-Patterson AFB, 231600Z Dec 55.


89. Memo, WDST/Col Otto J. Glasser, for All WDE Group Chiefs, subj: Advanced Reconnaissance System, Meeting Concerning, 28 Dec 55.


91. Ltr, WDST/ltCol John B. Hudson, to Distribution, subj: Reorganization and Realignment of Functions of Technical Operations (WDR), 10 Feb 56.

92. 80 No. 6, WDD, 5 Mar 56.


94. Msg, Comdr ARDC to Comdr WDD, 222015Z May 56.

95. Memo (C), USN Comdr Trux for Col Terhune, subj: Status of WS 117L Program as of 12 Jun 56, 12 Jun 56.

96. FAM No. 16, WDD, 5 Jul 56.

97. Ltr, WDD/MajGen B. A. Schriever to Mr. T. A. Smith, RCA, no subj, 11 Jul 56.


100. Ltr, WDD/MajGen B. A. Schriever, to Mr. Robert E. Gross, Lockheed Aircraft Corporation, No. subj, 2 Aug 56.


20. Ltr, BrigGen J. W. Sessums to CG, WADC, subj: Reconnaissance Requirements for Project ATLAS, 19 Jun 52.

21. Ltr, AFHRO-AN to CG, ARDC, subj: Satellite Study, 7 Jul 52.

22. Memo, Maj Robert T. Franzel to Col Pickel, subj: Status Report of Satellite Program, 21 Jul 52, w/note attached, (1) DD Form 95, Col Pickel to Gen Wood, w/Gen Wood's comment and endorsement to Gen Sessums; (2) Memo, BrigGen J. W. Sessums to Gen Putt, 29 Aug 52; (3) Memo, MajGen D. L. Putt to Gen Wood, 27 Sep 52.


25. DF, RDDS to RDFF, subj: Project FEEDBACK, 20 Aug 52.

26. DF, RDDMA to RDDS, subj: Feedback, 30 Dec 52.


28. DF, RDDSS to RDDA thru RDDS and RDDD, subj: Future Large Rocket Engine Requirements, 15 Apr 53.

29. DF, RDDSS to RDDSI, subj: Project Feedback, 3 Jun 53, w/o Incis.


102. PAM No. 21, WDD, 16 Aug 56.


104. SSD No. 117L (C), ARDC System Development Directive Advanced Reconnaissance System, 17 Aug 56; Amend No. 1, 26 Aug 56; Amend No. 2, no date; Amend No. 3, 15 Jan 58.

105. Ltr, Lockheed Aircraft Corporation to MajGen B. A. Schriever, no subj, 20 Aug 56.

106. MFR (C), LtCol Frederic C. E. Oder, subj: Minutes of Meeting on ARMA participation in WS 117L guidance effort - 22 Aug 56, 29 Aug 56.


108. PAM No. 28, WDD, 7 Sep 56.


111. DF (C), WDDR to WDDR, subj: Summary of Status and Policy Action Required on WS 117L Program, no date, w/1 Incl: Summary of WS 117L Problems Requiring Action.

112. DF, WDDR to WDDR, subj: Organization and Manning for WS 117L Program, 28 Sep 56.


115. Msg (C), Eq ARDC to CORF, Eq USAF, 11 Oct 56.


117. Msg (C), Eq USAF to Comdr ARDC, Info Comdr WDD, 22202222 Oct 56.

119. PAM No. 40, WDD, 2 Nov 56.

120. Ltr (C), WDT&R/Col Charles H. Terhune, Jr., to Director of A&D, Hq USAF, thru Comdr ARDC, subj; Fund Requirements for Weapon System 117L Program, 21 Nov 56, w/1st Ind, 26 Nov 56.

121. Ltr (C), Hq USAF to Comdr ARDC, subj; Requirement for Additional FY 1957 Funds for WS 117L, 10 Dec 56.

122. Ltr (C) WDT&R/LtCol Frederic C. E. Oder, to The Ramo-Wooldridge Corporation, subj; Recoverable Payload Package Study, 14 Dec 56.

123. Management Report (C), subj; Advanced Reconnaissance System, 18 Dec 56.

124. PAM No. 48, WDD, 19 Dec 56.

125. Ltr, WDT&R/LtCol Frederic C. E. Oder, to Mr. John H. McLaughlin, Administrative Contracting Officer, Lockheed Aircraft Corp., subj; Contract No. AF 04(647)-97, The Eastman Kodak Company, 21 Dec 56.

126. Ltr, WDT&R/LtCol Frederic C. E. Oder to The Ramo-Wooldridge Corp., subj; WS 117L Work Under Contract No. AF 18(600)-1190, 28 Dec 56.

127. Ltr, WDT&R/LtCol Frederic C. E. Oder, subj; Telephone Conversation with Mr. J. E. Carter - Lockheed MSD, 28 Dec 56.

128. Ltr (S/HQ), WDT&R/LtCol Frederic C. E. Oder, to Chief, Aircraft Reactors Branch, Attn: Major G. M. Anderson, Division of Reactor Development, AEC, 28 Dec 56.

129. Evaluation Criteria, Jan 57, w/3 Atchs: (A) Technical Evaluation, (B) Development and Production Aspects; (C) System Management Potential.


131. Ltr (C/HQ), WDT&R/BrigGen Ritland to Major Gen D. J. Keim, Chief, Aircraft Reactors Br, Div of Reactor Dev, AEC, no subj, 7 Jan 57.

133. Ltr (C), WDTA/MajGen B. A. Schriever, to Deputy COAF, Eq USAF, thru Comdr ARDC, subj: Planning and Funding Requirements for WS 117L, 30 Jan 57, v/1st Ind 5 Feb 57, v/5 of 6 Incls; (1) WS 117L FY 58 Fin Plan; (2) Justification for WS 117L Budget, FY 58; (3) FY 58 P-300 Fin Plan; (5) Flight Test Schedule; (6) Summary of TWX of 19 Jul 56.


135. Msg, Eq USAF to Comdr WDD, Info Comdr ARDC, 011712Z Feb 57.

136. Memo (C), LtCol Frederic C. E. Oder, for Col Terhune, subj: Visit to Missile Systems Division, Lockheed Aircraft Corporation, 50 Jan 57, 4 Feb 57, v/3 Incls; (1) LAC Organizational Chart; (2) LAC Organizational Chart; (3) Extract MSD 1593, LAC Summary Planning Data.

137. Msg (C), Comdr WDD (WDTA 2-2-N), to Comdr ARDC, 9 Feb 57.

138. MFR, Subject: Telephone Call from Mr. Jack Carter, Palo Alto, to General Ritland.

139. Ltr, Eugene S. Silberman, Contracting Officer, to Lockheed Aircraft Corporation, subj: Contract AF 04(647)-97, 11 Feb 57.

140. MFR, WDTA/LtCol J. L. Hamilton, subj: Phone call Between Myself and ColTerhune - '29 Feb.' 19 Feb'57.

141. Ltr (C), Eq USAF to Comdr ARDC, subj: Planning and Funding Requirements for WS 117L, v/1st Ind 13 Mar 57.

142. Ltr (C), Eq ARDC (RDZO) to LtGen D. L. Putt, no subj, 11 Mar 57, v/1 Incl: Ltr to USAF to Gen Ostrander, no subj, 6 Mar 57, v/1 Incl: Ltr, from NAS to Dr. Kaplan, 7 Jan 57.

143. Memo (C), WDTA/Col Frederic C. E. Oder, for Col Terhune, subj: Trip Report - Colonel Oder and Lt Colonel Riepe to Naval Research Laboratory 12 Mar 57 and Pentagon, 22 Mar 57.

144. Memo (C), WDTA/Col Charles H. Terhune, Jr., to Gen Schriever, subj: Letter on WS 117L, 27 Mar 57.

145. Manning Chart, WDTO, 2 Apr 57.


147. Msg, Comdr WDD to Director of Military Personnel, DCS/P, Eq USAF, 232400Z Apr 57.

149. **Staff Summary Sheet (8), Maj Dillon, subj: Air Force Satellite Program, 9 May 57**, w/3 Incls: (1) Memo for Deputy Secy of Defense; (2) Summary of The Advanced Reconnaissance System Development; (3) Summary of the Nati Security Council Papers on Satellites.

150. **Memo (C), Col Frederic C. E. Oder, for Col C. H. Terhune, subj: Ability of Aircraft Laboratory of WADC to fulfill WDR requirements, 9 May 57.**

151. **Memo, WDTI/Col Edward M. Hall, for Col Terhune, subj: Vanguard, 14 May 57, w/1 Incl of 2: (2) EW Study, Proposed Use of INEM as Booster for Multi-Stage Vehicles, 1 Apr 57.**

152. **Memo, Eq USAF/LtGen D. L. Putt, for Chairman Scientific Advisory Board, subj: SAB Special Study of Advanced Weapon Technology and Environment, 15 May 57.**

153. **Memo (C), Col Charles H. Terhune, Jr., for Gen B. A. Schriever, subj: ARS (Eastman Kodak), 21 May 57, w/1 Incl, Draft ltr to Dr. Chapman.**

154. **Go No. 19 ARDC 21 May 57.**

155. **Memo (C), WDT/Col Charles H. Terhune, Jr., for Col Oder, subj: Charter - WS 117L Site Selection Board WDD, 1 Jun 57.**

156. **Ltr (C), WDD/MajGen B. A. Schriever to Dr. Albert K. Chapman, no subj, 26 Jun 57.**

157. **PAM No. 34, WDD, 28 Jun 57.**

158. **Memo (C), Col Asa B. Gibbs, subj: Revision of the WS-117L Program, 5 Jul 57.**

159. **Ltr, Lockheed Aircraft Corporation, to Chief, BMD, thru Asst AFFR, Lockheed Aircraft Corp, subj: AF 04(647)-97, 8 Jul 57.**

160. **DF, MCPTA to MCPT, subj: Weekly Diary - 12 Jul thru 18 Jul 57, 18 Jul 57.**

161. **Briefing (C), Presentation to the Scientific Advisory Board Ad Hoc Committee to Study Advanced Weapons Technology and Environment, 23 Jul 57.**

162. **Ltr (C), WDT/Col Charles H. Terhune, Jr., to Deputy CofS, Development, Eq USAF, thru Comdr ARDC, subj: Program Planning Guidance for WS 117L, 30 Jul 57.**

163. **Memo (C), WDT/Col Frederic C. E. Oder, for Col Terhune, subj: First Meeting of the SAB Ad Hoc Committee on Advanced Weapons and Environment, 29-31 Jul 57, 1 Aug 57, w/2 Incls.**

165. Ltr, Ballistic Missile Office/Eugene S. Silberman, Contracting Officer, to Lockheed Aircraft Corporation, subj: Contract AF 04(647)-97, Status of Contract Funds, 13 Aug 57.

166. DF, WDT to WDCSM, subj: WS 117L R&D Manpower Program Summary, 14 Aug 57, w/1 of 2 Incl: (2) DF, WDT to HDEAP, subj: System Development Plan No. 117L, 9 Jul 57, w/1 Incl, HDEO Comments on SDF No. 117L, w/Atch 1, Comparative Manpower Figures of System Development Plan No. 117L & D-33.


169. Ltr, AMC (BCM)/Eugene S. Silberman, Contracting Officer, to Lockheed Aircraft Corporation Thru Asst AF Plant Rep, subj: P-600 Expenditure Ceilings FY 58, 21 Aug 57


171. Ltr (C), Hq USAF/LtGen D. L. Putt, to Comdr ARDC, subj: Program Planning Guidance for WS 117L, 3 Sep 57.

172. Ltr (C), WDT/BGen O. J. Ritland, to Director of R&D, Hq USAF, subj: WS 117L Funding FY 58 and FY 59, 19 Sep 57, w/4 Incl: (1) FY 58 Fin Plan Summary; (2) FY 59 Fin Plan Summary; (3) FY 59 Fin Plan Summary Desired Budget; (4) CY TMX, MCPTA-9-1-E, 12 Sep 57.

173. Memo (C), MCPTA/LtCol James S. Seay, to Gen Funk, subj: Possible Items for Discussion at Lockheed Missile Systems Division, 7 Oct 57, w/1 Incl: Cy ltr to LMSD, 23 Sep 57.

174. Msg (C), AFCOM Cite 51210, to Comdrs AFBMD and BMO, info to Comdr ARDC, 061815Z 23 Oct 57.

175. Msg (C), AFBMD WDC-10-3-E, to CofS USAF, info Comdr ARDC, 090926Z 23 Oct 57.


177. Msg (C), AFBMD WDT 10-8-E, to CofS Hq USAF, Comdr ARDC and AMC, 10 Oct 57.

179. Msg (C), Cite AFED-88 51476, 151402Z Oct 57.

180. Ltr (C), HQ USAF/LtGen D. L. Putt to LtGen S. E. Anderson, Comdr ARDC, no subj, 17 Oct 57.

181. Msg (C), AFEMF Cite 51689, 182025Z Oct 57.


183. MFR (C), Col Frederic C. E. Oder, subj: Briefing of Deputy Secretary of Defense, Mr. Quarles on WS 117L (ARS) on 16 Oct 57, 25 Oct 57.


185. Memo (C), Col Frederic C. E. Oder, for Col Terhune, subj: Informal Reaction of the "Stewart" Committee on Special Capabilities to the 18 October Presentation on WS 117L, 31 Oct 57.

186. Msg (C), Cite AFEMF 52291/COM, to Comdr AMG, info Comdr AFEM, 012034Z Nov 57.


188. Briefing (C), title: Briefing on WS 117L to the Air Council, 5 Nov 57.

189. Msg (C), Cite AFEMF 52392, 051538Z Nov 57.

190. MFR (C), WDTIA/LtCol Sidney Greene, subj: THOR Space Flight Capability, 8 Nov 57.

191. SSS (C), AFDEC-SP/LtCol Ralph E. Munziato, subj: Outer Space Vehicle, 12 Nov 57, v/1 Inc1L (1) Proposed Memo for Sig v/1 Inc1L.


193. Msg (C), Cite TWX-033, to Comdr AFEM, 131913Z Nov 57.

194. Msg (C), Cite TX 11-049, to Comdr AFEM, 191850Z Nov 57.

195. MFR (C), WDTIA/LtCol Sidney Greene, subj: Study of Thor for Space Flight Testing, 22 Nov 57.


199. Mag, Cite TXN 12-009, to Comdr AFMD, 03194½Z Dec 57.

200. Mag, Comdr ARDC to Comdr AFMD, Cite NSF-12-4-E, 4 Dec 57.

201. Report (C), title: Report of the Scientific Advisory Board AEHOC Committee on Space Technology, 6 Dec 57.


203. Ltr (C), HIER/MajGen B. A. Schriever, to Mr. J. Eugene Boot, WP and Gen Manager, Lockheed Aircraft Corp., no subj, 23 Dec 57.

204. Memo (C), Doc, to Col MacDonald and Gen Funk, circa Jan 1958, w/1 Incl; Draft Ltr to The Remo Wooldridge Corp, w/2 Incls: (1) NFR, DAF/Roger Lewis, 6 Sep 57; (2) Statement of Work, WS 117L Program Assistance, 1 Jul 57 - 30 Jun 58.

205. ARDC Form 111 (C), Management Report, subj: Advanced Reconnaissance System, WS 117L - Short Title: ARS, WS 117L, 6 Jan 58.

206. IF, MCPTA to MCPT, subj: Weekly Diary - 10 thru 16 Jan 58, 16 Jan 58.


208. Mag (C), Cite AF/DC-SP 55521, 22221½Z Jan 58.


210. Mag (C), Cite AF/ET-W-1 55965, 31182222 Jan 58.

211. Msg (C), Cite AFCON 56082, 3 Feb 58.

212. Memo, WDT/Col Charles H. Terhune, Jr., to Col Oder, subj: R-W Participation in WS 117L, 4 Feb 58.

213. DF (C), MCPTA to MCPT, subj: Weekly Diary - 31 Jan thru 6 Feb 58, 6 Feb 58.


215. DF (C), MCPTA to MCPT, subj: Weekly Diary - 7 thru 13 Feb 58, 13 Feb 58.

216. Msg, Cite TRX 02-022, to Comdr AFEMD, 141757Z Feb 58.

217. Memo, WDOE/Col J. L. Hamilton, for Col Terhune and Dr. Remo, subj: ARDC Ad Hoc Committee on Geophysical Support Requirements, 14 Feb 58.

218. Ltr, MCPT/BrigGen Ben I Funk, for Gen Schriever, subj: Air Force policy Governing R-W, 14 Feb 58, v/2 Incls: (1) MCPT Memo for Gen Schriever, subj: R-W Role with Respect to WS 117L, 14 Feb 58; (2) Draft Ltr to Secy of AF, subj: The Remo-Wooldridge Corp.


221. Memo (s), SAFRD/Richard E. Horner, for the Secretary of Defense, no subj, 21 Feb 58.

222. Memo (C), Under Secretary Malcolm A. MacIntyre, for the Director of Guided Missiles, OSD, no subj, 21 Feb 58.

223. Memo (C), SD/Neil McElroy, for the Secy of the AF, subj: Air Force WS-117L Program (Reconnaissance System), 24 Feb 58.

224. Mag (C), from WDT/2-18-E, to Comdr ARDC, 25 Feb 58.

225. Mag (C), AFCON 56978 to Comdr ARDC, info Comdr AFEMD, 262034Z Feb 58, quoting AFCON msg 56082, dated 3 Feb 58.

226. Memo (C), OSD/Roy W. Johnson, Dir, ARPA, for the Secretary of the Air Force, subj: Reconnaissance Satellites and Manned Space Exploration, 26 Feb 58.
227. MFR, WDGE, subj: Call from General McCrooke, 28 Feb 58.

228. Memo (c), WDRE/Col Frederic C. E. Oder, to Col Farhume, subj: Differences between 117L Thor and Atlas Launched Programs, 3 Mar 58.

229. Mag (c), Cite AFCVC 57197, 032022Z, Mar 58.

230. Memo, Hq USAF CoFS/Maj Gen Jacob E. Smart, for Distribution, subj: Space Projects Involving ICBM/IBM Components, 4 Mar 58.

231. Mag (c), Cite TEX 03-014, 051625Z Mar 58, quoting Memo for the Secy of AF, 26 Feb 58.

232. Teleconference (c), regarding requirements of Johnson: memo of 28 Feb, subj: Reconnaissance Satellites and Manned Space Exploration, and AFCVC 57197, 3 Mar 58 mag.

233. Mag (c), Cite RDQM-2-7-E, 8 Mar 58.

234. Mag (c), Cite AFCOM 57767, 10 Mar 58.


236. Memo (c), DOD Armed Forces Policy Council, to Members of the Armed Forces Policy Council, subj: Publicity on ARPA Projects and New Missile and Satellite Developments, 19 Mar 58.

237. Memo (c), AF Under Secy Malcolm A. MacIntyre, for Director ARPA, subj: WS 117L, 19 Mar 58.

238. Mag (c), AFCVC 57197, 23 Mar 58, reference Mag AFCVC 56978 dtd 26 Feb 58.


241. DOD News Release, subj: Secretary McElroy announces New Space Programs, 27 Mar 58.

242. Memo, WDRE/Lt Col Donald L. Perry, for Gen Schriever, subj: Message from SAFIE, 1 Apr 58.

243. Mag (c), Cite AFCOM 59270, 092119Z Apr 58.

244. Ltr Ind, WDTSR, 15 Apr 58, to Ltr APOPP-CC-R, Hq USAF, 2 Jan 58, subj: FOC for ARS.
245. Memo, ARPA, for the Commanding General, Ballistic Missile Div, ARDC, subj: Presidential Approval of ARPA Projects, 17 Apr 58.

246. Ltr (C), WTR/BrigGen O. J. Ritland, to Asst CofS for Guided Missiles, Eq USAF, subj: Reduced FY 59 Program for WS 117L, 21 Apr 58.

247. Mag (C), Cite AFWS 50190, 292128E Apr 58.

248. Mag, Cite RDGQ-5-1-1-E, 061959Z May 58.

249. Mag (C), WDF-5-2, to CofS Eq USAF, info Comdr ARDC, 14 May 58.

250. Mag (C), WDF-5-3, to CofS Eq USAF, info Comdr ARDC, 14 May 58.

251. Mag (C), Cite INX 05-15-01, 151450Z May 58.


254. Mag (C), Cite AFCOM 51207, 231401Z May 58.

255. Mag RDGQ 6-1-58, 041700Z Jun 58.

256. Mag (C), WDGQ-6-2, 10 Jun 58.

257. Memo (C), USAF Under Secretary Malcolm A. MacIntyre, for the Director, ARPA, 12 Jun 58.

258. Ltr, ARDC/LtGen S. E. Anderson, to MajGen B. A. Schriever, 13 Jun 58.

259. Memo (C), ARPA/Roy W. Johnson, Director, for the Secretary of the Air Force, subj: Military Reconnaissance Satellite Progress Report, 18 Jun 58.

260. Memo (C), Office of the Under Secretary, DAF, for the Chief of Staff, no subj, 24 Jun 58.

261. ARPA Order No. 9-58 (C), ARPA to CG, BMD, no subj, 30 Jun 58. (Amendments 1 to 6 are contained in these volumes; Amendments 7, 16 Feb 1959 to 16 dated 3 Dec 1959 are contained in 1st Volume of SAMOS Documents).

262. Draft Report, Comments on Space, 30 Jun 58.

264. Minutes of Twentieth Meeting AFEMC (C), 8 Jul 58.

265. Ltr, Hq USAF/BrigGen H. A. Bouckey, to Comdr AFEMD, subj: Progress Reports, WS-117L, 10 Jul 58.

266. Memo (C), ARPA/Roy W. Johnson, for the Commanding General, Ballistic Missile Division (AFEMD), subj: Military Reconnaissance Satellite Report, 15 Jul 58.

267. ARPA Order No. 9-58 Amendment No. 1, 17 Jul 58.


270. ARPA Order No. 9-58 Amendment No. 2, 4 Aug 58.


273. Bk No. 4-770 ARDC 22 Aug 58.

274. ARPA Order No. 9-58 Amendment No. 3, 25 Aug 58.

275. Msg (C), Cite AFGERM 56501, 26193728 Aug 58.

276. Ltr, ARDC/ltGen S. E. Anderson, to Gen Curtis E. LeMay, WCOFS, Hq USAF, no subj, 26 Aug 58, v2 incld: (1) Chart reflecting new organization for AFEMD; (2) Chart showing new Military Space organization in detail.


278. Memo (C), ARPA/Roy W. Johnson, for Comdr AFEMD, subj: Large Booster for Future Space Projects, 3 Sep 58.

279. Msg (C), RDGCM-9-6-E, 041800Z Sep 58.

280. Memo (C), ARPA/Roy W. Johnson, for Comdr AFEMD, subj: Redefinition of WS 117L, 10 Sep 58.

281. Memo, WDEPR/MajGen B. A. Schriever, to Generals Funk and Large, Dr. Ramo, All Personnel, AFEMD, subj: Announcement of AFEMD Internal Reorganization, 12 Sep 58.
282. Mag (C), Cite AFDEC 57155, 1220332 Sep 58.

283. Memo, USAFR/BrigGen O. J. Ritland, for Generals Funk and Large, Dr. Ramo, All Personnel, AFMD, subj: Organizational Announcement, Organization of the Deputy Commander Military Space Systems, AFMD, 16 Sep 58.

284. Mag (C), Cite 3347, 23220722 Sep 58.


286. ARPA Order No. 9-58 Amendment No. 4, 25 Sep 58.

287. GOR No. 80 (C), title (C), General Operational Requirement for a Reconnaissance Satellite Weapon System, 26 Sep 58; GOR 80-1, same title, same date; GOR 80-2, same title, same date; GOR 80-3, same title, same date; GOR 80-3B (C), title: Amendment to a GOR, 9 Feb 59, later cancelled by GOR 209, 28 Jan 64 (see MIDAS docs); GOR 80-4, same title, same date as basic GOR.

288. ARPA Order No. 9-58 Amendment No. 5, 29 Sep 58.

289. Ltr (C), WDZ/MajGen B. A. Schriever, to Mr. Roy Johnson, Director, ARPA, no subj, 9 Oct 58.

290. Ltr (C), WDZ/MajGen B. A. Schriever, to Mr. Roy Johnson, Director, ARPA, no subj, 9 Oct 58, w/1 INCL: FY 59-60 Adv Mil Space Sys Cost Schedule.

291. MFR (C), WDZ/Col Frederic C. E. Oder, subj: Review by ARPA Ad Hoc Committee of the 15 September 1958 WS 117L (SENR) Development Plan and Related Actions During the Period 30 September-10 October, 15 Oct 58.


293. Ltr (C), ARPA/Roy W. Johnson, to General Schriever, no subj, 20 Oct 58.

294. Minutes of Twenty-Fourth Meeting ARMC (C), 20 Oct 58.

295. Mag, WDZM-10-3, 23201022 Oct 58.

296. Mag (C), ARABF 50054, 24162322 Oct 58.

297. Memo (C), AF Under Secretary Malcolm A. MacIntyre, for the Director of ARPA, subj: FY '59 117L Program, 17 Nov 58.

299. Msg (C), Comdr AFMD (WDO) to CofS Eq USAF, info Comdr ARDC, 240255Z Nov 58.

300. Msg (C), Comdr AFMD (WDO-12-1), to OSD ARPA, info CofS Eq USAF and Comdr ARDC, 041735Z Dec 58.

301. Memo (c), ARDC/Roy W. Johnson, for the Secretary of the Air Force, subj: WS-117L Program, 4 Dec 58.

302. Memo (c), ARDC/Roy W. Johnson, for the Under Secretary of the Air Force, subj: DISCOVERER-THOR Project and SENTRY Programs, 5 Dec 58.

303. Msg (C), OSD ARPA to Comdr AFMD, info Comdr ARDC, 092108Z Dec 58.

304. ARPA Order No. 9-58 Amendment No. 6, 11 Dec 58.

305. Memo (C), WDZ, for Asst Deputy Commander for Weapon Systems, Electronics, subj: Surveillance Requirements, 18 Dec 58.


307. Msg (C), AFMD-54539, 30-Dec-58.

308. Charts (C), title: Sentry Flight Test Vehicle Production Program IIA, 2 each, 31 Dec 58.
EVALUATION CRITERIA

The attached evaluation criteria follow the same basic pattern of
the Prime Contractor evaluation of the Pied Piper studies which resulted in
the MS 117L program. They are divided into the same three main groups, but
the actual criteria have in part been modified to better fit the job at hand:

A. Technical Evaluation

B. Development and Production Aspects

C. System Management Potential

It is considered essential that certain of these criteria must be
affirmatively satisfied for the potential source to be considered a competitor.
Hence, screening of all possible sources will be accomplished by a kind of "go"
or "no go" process comparison against the essential criteria or factors.
Criteria for Choosing Contractor

Prime:

1. The integrating aspect of subsystem I is the method to be employed within the subsystem of marking, indexing, storing, retrieving, and disseminating both numerical type information (e.g., targeting) and "intelligence-like" data (photo interpretation notes, target descriptive data, etc.).

Prime Contractor should have up-to-date knowledge and capability in this area. This knowledge must include complete overall understanding of the organization and operation of the AF intelligence community and its relationships with other agencies, in addition to working knowledge of sources of raw data and uses of produced data at all echelons.

2. Prime Contractor should have in-house, or readily available, a capability to effectively accomplish design, test knowledge related thereto, and monitor and merge capabilities in the following areas:

<table>
<thead>
<tr>
<th>Scientific</th>
<th>Application Fields</th>
<th>Operations</th>
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<tbody>
<tr>
<td>Electronics</td>
<td>Photogrammetry and</td>
<td>Photo-Lab</td>
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<tr>
<td>(Electro-Optical)</td>
<td>Dimensional Cartography</td>
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<tr>
<td>Optics</td>
<td>Systems Analysis (Quant &amp; Qual)</td>
<td>Electronics Maint.</td>
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<tr>
<td>Semimetrical</td>
<td>Flint Data Handling (Collection)</td>
<td>Mech. and Optic Maint.</td>
</tr>
<tr>
<td>Documentation (Info-organizing)</td>
<td>Communications</td>
<td>Computer Prog.</td>
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<tr>
<td>(Codexy)</td>
<td>System Design (of above)</td>
<td>Photo-interpretation</td>
</tr>
<tr>
<td>Display Technology</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Prime Contractor must demonstrate understanding of problem through projection of use of the collected data in the time period of operational use.

a. Certainly many of present functions will be in the obsolescence phase with air breathing and ballistic missile type targeting problems being paramount.
b. The likely contribution to the sensing problem while at first may be small should be recognized realistically and provided for in the system design.

c. Of great importance in understanding of how the AES data can be correlated and used to support and direct programming of other collection systems and how the collected products can best be used mutually supporting to provide the most efficient use of all data.

d. Intelligence know-how, systems design experience, system development management, facility operation management are desirable experiences for the particular prime contractor team. Technical and managerial competence of team.

e. Prime Contractor must recognize in detail and be responsive to the two interface areas of this system — one with the collection system and certain of its subsystems, which will entail much close liaison with the other prime contractor for the system, and the other with system k32L or some similar system which, in general is involved with improvements in the over-all intelligence system. To accomplish this part of the problem, certainly the technical ability to understand the design and development problem of the other part of H3 3117 and k32L is required, however, in addition the quality of intellectual honesty, cooperation, objectivity, flexibility and the ability to work well with others is of at least equal importance.
Development and Production Approaches

1. System Management Approach
2. Assignment of enthusiastic experienced high caliber personnel
3. Pledge of top level corporate emphasis on program
4. Master Plan
   a. Program Cost
   b. Labor Requirements
   c. Facility Requirements

Prime Contractor must have demonstrated ability to make and meet funding and time estimate in his projected programming. This implies a prime contractor of excellent integrity.

5. Amount of Subcontract effort -- strength of likely subcontractors.

Prime Contractor must have willingness to supplement design and development capability with subcontractor effort, since no existing single contractor has unique self contained capability for the diverse problem of this subsystem.
Section 1. Concept  

1. Provide best over-all understanding of and approach to the problem of designing, developing, producing and operationally testing an efficient system to handle the NS 1172 collected data most reliably to satisfy intelligence of the period users and matched in time to the collection capability of the system, quantity, quality and type of sensed data. In addition the ABS system must be capable of and actually meshed with the existing intelligence system of the period, whether it be NPT or just improved versions of the current system.

a. Contractor Philosophy — Program Adequacy:

(1) Knowledge of basic intelligence needs and objectives projected to use period

(2) Knowledge of projected weapon types, capabilities and info needs

(3) Since (1) and (2) are dynamic, design must express flexibility of thought, initiative, and span of purpose.

(4) Knowledge of intelligence user requirements and national and technical environment affecting these.

b. Interference With (or From) Other Programs

Extent of Scientific and Technological effort in many different and frequently unrelated areas which will be required for the successful prosecution of S.S.I. This places a premium on systems management of a high order and a degree of scientific versatility which is rare.

(1) Ability to function as a tightly-knit systems management team. ("first team" availability)

(2) Prime Contractor should stand prepared to organize exclusively
for the system design and facility management of this subsystem.

c. **Motivations and Contractor Relationships**

   (1) Why is contractor interested in participating?

      (a) $\square$

      (b) Prestige

      (c) Sincere belief in program importance

   (2) Interest to cooperate in every possible way with AF

   (3) Establish good reputation in the S/H field.

   (4) Responsive attitude and flexibility and willingness to accept AF direction.

d. **Operational System Test Plan**

   (1) Over-all test philosophy

   (2) Early testing of parts of the system and of the system as a whole through modeling a simulation.

   (3) CPI's prior to operation to checkout saturation level points and reaction of system when saturated

   (4) Personnel training test bed (?)
MEMORANDUM FOR General Ritland

SUBJECT: AEC Contract Work Statement Definitization Meetings

1. I believe that Colonel Norton has spoken to you informally in a request for you to give the lead-off talk at the above series of conferences. The initial conference, which will commence at 1000, Tuesday, 15 January 1957, will be attended by approximately 30 representatives from the ARDC Centers and will be held in Room 218, Hill 5.

2. The purpose of calling all of these representatives together is to assist the NS 117L Project Office in writing the definitive work statements for the contracts with Lockheed Aircraft Corporation and Massachusetts Institute of Technology for the AEC. In addition, and closely related to this, will be the preparation of detailed plans for the subsystem projects of NS 117L.

3. The Center representatives who will attend are those who have been participating in the past as technical advisors in the AEC Program. For the purpose of this series of conferences, they have been furnished appropriate material generated by the NS 117L Project Office and IAC.

4. As soon as the whole group has been given its instructions as to the end product desired it will be broken up into working groups, one for each of the subsystems concerned. Each of these working groups will be chaired by the appropriate subsystem project officer from MDTR. Once these subsystem project plans and definitive work statements have been drafted up by the working groups, they will be reviewed by MDTR, and subsequent meetings will be arranged between MDTR plus a few of the Center representatives with IAC representatives to come to agreement on the work statement of the contract. All of this of course is necessary before the actual definitive contract negotiations can be entered into between the AF and IAC as well as the AF and MIT.

5. By way of philosophy, the entire group will be reminded that in any system development activity, there is a logical spectrum of activity from the study phase to a specific engineering description of the end product. Colonel Oder will point out to the group just where we stand on the AEC system in regard to this spectrum at the present time, and will ask the group to use engineering and management judgement in attempting to describe the end product to the degree necessary to write a good contract while bearing in mind that as we proceed we will undoubtedly have to amend our goals.
6. In view of the not inconsiderable support that the ARS project has enjoyed from ARDC Centers in the past, I think it quite appropriate that MDD show them by your participation at the initial session the importance that we attach to the proper management of this system.

CHARLES H. TERRUNE, JR.
Colonel, USAF
Deputy Commander
Technical Operations
MEMORANDUM TO: WDTX

JAN 25 1957

SUBJECT: Major Events of CY 1956 for MS 117L

1. In accordance with instructions furnished at the WDT Staff Meeting, 15 January 1957, herewith are a listing of events concerning MS 117L which should be transmitted to the Historian, WDD:

a. In the early months of 1956, the Weapon System Project Office for MS 117L was formed at WDD using as a nucleus officers transferred from Detachment 1, Headquarters ARDC, Wright-Patterson Air Force Base, who had previously been associated with the program. Western Development Division had been assigned responsibility for the MS 117L Program in accordance with the authority contained in SR 5, Headquarters ARDC, dated 17 October 1955.

b. Under the authority of WDD Special Orders No. 6 dated 5 March 1956 a Contractor Evaluation Board was established. Members of the board were:

   Colonel William H. Baynes, HERADC, President
   Lt Colonel R. C. Holik, HERADC
   Commander R. C. Truxx, WDD
   Lt Colonel W. G. King, Jr., WADC
   Lt Colonel V. M. Gene, HERADC
   1/Lieutenant R. S. Washburn, HERADC
   Mr. R. S. Blocker, HERADC

   The board convened at WPAFB during the period 12 - 20 March 1956 and submitted its report and recommendations to the Commander WDD on 20 March 1956.

c. Following the recommendations of the contractor selection board, which were approved by Hq. ARDC and Hq. USAF, representatives of the ARDC Centers together with the WDD staff met to prepare the Initial Development Plan for MS 117L. This was completed on 2 April 1956, and submitted by Commander WDD thru Commander ARDC to Hq. USAF. Simultaneously, a series of presentations covering material contained in the Development Plan were given to the Commander ARDC and to the DOD/D, Hq. USAF. These briefings culminated with a presentation to the Honorable Donald A. Quarles, Secretary of the Air Force on 10 May 1956.

d. On 13 July 1956, a special presentation on MS 117L with particular reference to technically difficult subsystems and components of the over-all system was made by a WDD team headed by Brigadier General O. J. Rutland to the President’s Science Advisory Committee,
which is constituted under the Office of Defense Mobilization. Subsequently, a letter which favorably accepted the proposed system for the Chairman of the committee, Dr. I. Rabi to the Defense Mobilizer, the Honorable Arthur Flemming.

c. On 3 August 1956, Development Directive 85 was issued by the USAF approving the development of the ARS. This was followed by Systems Development Directive No. 117L, 17 August 1956, issued by HQ, ADC. These documents made available an initial funding of three million dollars ($3,000,000) in F-600 funds.

f. During the ensuing period, requests for additional funds were sent thru HQ, ADC to DCS/D HQ, USAF resulting ultimately in the commitment of ten million dollars ($10,000,000) in F-600 funds plus an as yet unspecified amount in P-100 and P-200 funds for the ARS Program for FY 1957.

g. On 5 November 1956, the prime system's contract for the development of WS 117L was let between the Air Force and the Lockheed Aircraft Corporation. The IAC had been the contractor recommended by the Contractor Evaluation Board referred to previously.

h. As of the end of the year, the Project Office consisted of 10 officers and 3 civilians. Lieutenant Colonel Frederic J. 3. Oder, 766th, was the Assistant for WS 117L, Technical Operations, ADC, and as such, Chief of the Weapon System Project Office, having succeeded Colonel O. J. Glasser in this capacity as of 13 August 1956.

2. In the event that further information is required, it is requested that the Historian, ADC, contact NDTI directly.

Lt Colonel, USAF
Assistant for WS 117L
Technical Operations
SUBJECT: Planning and Funding Requirements for WS 117L

THRU: Commander
Air Research and Development Command
ATTN: RD20
Post Office Box 1395
Baltimore, Maryland

TO: Deputy Chief of Staff, Development
Headquarters USAF
Washington 25, D. C.

1. In your letter dated 10 December 1956, (U) Requirement for Additional FY 1957 Funds for WS 117L to the Commander, Air Research and Development Command, guidance is furnished for the planning of the Advanced Reconnaissance System Program. While this guidance will be reflected in a revision to the WS 117L Development Plan now in preparation, there are certain aspects of the problem which should be brought to your attention at this time.

2. I have interpreted your guidance that we should not plan to launch this system prior to FY 1961 to mean that a satellite with a military reconnaissance capability not be launched on an operationally useful orbit until that date. In view of the extensive development and test which must precede such an event, this guidance is not considered to be restrictive at the present time.

3. Realizing the P-600 funding problems that must be considered during FY 1958, the need for establishing ceilings in this fund area is understandable. These P-600 funds cited in your letter are, however, inadequate to meet the minimum component development and test needs of this program. Both Secretary Quarles and you have pointed out the magnitude of the development program associated with this system and have recognized that it utilizes a new mode of transportation and requires many new features in its reconnaissance and data link equipment.

DOWNGRADED AT 12 YEAR INTERVALS. NO AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10
4. An FY 1958 Financial Plan for WS 1171 which is based upon a ten million dollar ($10,000,000) program in P-600 funds is Enclosure 1. Enclosure 2 states those goals which we can reach and those which cannot be reached. This level of funding will cause serious slippage in the achievement of certain of the reconnaissance capability of the system, particularly in the ferret and infra-red areas.

5. Facilities required are computed upon the basis of new construction and total four million five hundred thousand dollars ($4,500,000) in P-300 funds (Enclosure 4). Every attempt will be made to utilize existing and available facilities with a corresponding reduction in new construction cost. Enclosure 3 points out the need for authority to commence A and E work for a number of these facilities during FY 1957. Early approval of the A and E work is requested.

6. The test schedule (Enclosure 5) is attainable but our ability to develop components for testing is directly related to the funds available.

7. Western Development Division has been informedly advised that there is presently no line item for WS 1171 in the FY 1958 P-100 and P-200 budgets. An FY 1958 budget estimate for WS 1171 (Enclosure 6) was submitted by TWX(SECRET) WFTR 7-3-8-3-E, 19 July 1956, to Headquarters ARDC. Information received from Headquarters ARDC indicates that this budget estimate was contained in a letter from Commander ARDC to the Director of Budget, Headquarters USAF, 23 August 1956, "FY 1958 Budget Estimate for Systems."

8. To permit an orderly management of the ARS program, urgent action is requested in regard to our letter, 21 November 1956, "Fund Requirements for WS 1171 Program."

a. Lack of FY 57 P-100 and P-200 funds is preventing procurement of material and equipment essential to maintaining a balanced system oriented program.
b. FY 57 funds to cover procurement of the four (4) SM 65 boosters are still a very valid requirement and are not affected by the guidance contained in your letter. The lead time for procurement, assembly and check-out of the boosters and the WS 117L test items dictates that these funds be available to Western Development Division no later than February 1957.

6 Inc:
1-WS 117L FY 58 Fin Plan
   1 pg, 2 cys WDIN 57-13
2-Justifi for WS 117L
   Budget, FY 58, 7 pgs
3-FY 58 P-300 Fin Plan
   1 pg, 2 cys WDIN 57-13
4-Form 161, 12 pgs, 2 cys
   WDIN 56-220
5-Flight Test Schedule
   1 pg, 2 cys WDIN 57-13
6-Summary of TMX of 19 Jul 56
   (WDIN 7-3-S-E) 1 pg, 2 cys
   WDIN 57-13
WDTR, WDD, 30 Jan 57, Subj: (U) Planning and Funding Requirements for WS 117L

RIDenow

1st Ind

3 Feb 57

HEADQUARTERS, AIR RESEARCH AND DEVELOPMENT COMMAND, Post Office Box 1395, Baltimore 3, Maryland

TO: Deputy Chief of Staff, Development; Headquarters USAF, Washington 25, D. C.

1. This Command recognizes the limitations imposed in your letter, subject; (U) Requirement for Additional FY 1957 Funds for WS 117L, dated 10 December 1956, as restricting the P-600 funding for WS 117L to $10,000,000 in FY 1958. In order to maintain the proper balance between component development, fabrication, and testing for WS 117L, as directed by the Secretary of the Air Force, it is strongly urged that every effort be made to obtain P-100, 200, and 300 funds for FY 1957 and FY 1958 in the amounts indicated by the Western Development Division. -(SECRET)

2. The data contained in the inclosures to the basic letter are intended to provide members of your staff with the most up-to-date information regarding our plan for conducting the WS 117L development in accordance with the guidance we have received. (Unclassified)

6 Incls
n/c (1 cy ea)

SIGNED

DON R. OSTRANDER
Brigadier General, USAF
Assistant for Guided Missiles Systems
Deputy Commander/Weapon Systems

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

CONFIDENTIAL
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<tr>
<th>Sub-systems</th>
<th>P-100</th>
<th>P-200</th>
<th>P-300</th>
<th>Total</th>
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<td>Facilities</td>
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Note: P-300 financial plan for details.

Exhibit the efforts at the AEC Center in Sub-systems B, C, D, I and K. Complete justification of how the funds in each of these areas are to be used in Enclosure 2.
I. The flight test schedule which is keyed to progress expected in the system development is that shown on Inclosure 5. Whether this schedule could be realized or not would depend in a large degree to the funding provided in both FY 57 and FY 58. While this schedule represents a stretchout over that approved in the NS-117 Development Plan of 2 April 1956, earlier flights are proposed. These earlier flights are based on an estimated improvement in the availability of St. 65 missiles to the NS-117 program and are required to gain the earliest possible information on the several unknowns relating to the design of the 495 vehicle and to the environment under which many of the subsystems will have to operate. The results obtained with these three (3) flights could have a very great impact on the design of the system and would minimize the possibility of expanding funds unnecessarily on unprofitable approaches. The flight test schedule represents a fifty per cent (50) reduction in the number of flights compared to that shown on the 2 April 1956 Development Plan. Adhering to the ceiling specified in DOS/D letter of 10 December, cuts have been made in the following order:

a. Those areas that control the quantity of information put out by the system.

b. Those areas that affect the operational accuracy of the system after it is developed.

c. Those areas that affect the quality of the information provided by the system.

Overriding emphasis will be placed on the pioneer visual capability and work on other capabilities reduced to a study and component-test level. The operational data for the visual system capable of a high data rate will be postponed by about two (2) years over the Development Plan of 2 April 1956. A tabulation of FY 58 fund requirements is contained in Inclosure 1.

II. SUBSYSTEM

I. Vehicles. Two million dollars (2,000,000) of P-600 funds are allocated to this subsystem. This, together with those FY 57 funds allocated to this subsystem will be spent for design and initial testing of the pioneer visual vehicle. The funds will cover, in a marginal fashion, the development of the tankage which constitutes the hard core of the vehicle and the skin and fairings for this vehicle. The funds will also cover design and fabrication of prototype of vehicle ground servicing equipment. No work will be done on the advanced vehicles. It has been determined that such an advanced vehicle would permit a forty per cent (40%) increase in payload that would more than development costs in about
on year of operation, then, every year's delay in initiating development of the advanced vehicle with its associated propulsion system will result in incurring additional operational costs roughly equal to the development costs for the advanced vehicle.

The ground test program for the vehicle and propulsion system will have to be curtailed sharply. This will result in a lower vehicle reliability. Since the cost of each launching is in the neighborhood of four million dollars ($4,000,000), short range economy in this area also carries a definite possibility of long range waste of funds.

Only design studies will be made on the ssi and infra-red vehicle configuration.

A total of 11.3 million dollars of P-300 money is required in the vehicle program. Of this amount, $3.8 million is required for the procurement of ground and flight test orbital vehicles, and 7.5 million for the procurement of four (4) 545 boosters. This is based on the assumption that four (4) boosters are needed in FY 57 in accordance with current requests. If fewer than four boosters are needed in FY 57, the difference must be made up in FY 58 if the schedule is to be maintained. Current booster lead time requirement is approximately 23 months in advance of flight date. 2.9 million P-200 funds will be required for the purchase of servicing equipment, checkout consoles, specialized automotive vehicles, erection equipment and other items for the support of the vehicle ground and flight test program.

II. Propulsion. 19 P-600 funds will be allocated under this budget to propulsion in FY 58. This is based on the assumption that the engine will be brought to an acceptable state of reliability by the approximate 1.7 million dollars of P-600 funds allocated to the powerplant out of the FY 57 budget. If unforeseen development problems arise in FY 58, the program will be in difficulties.

It is hoped that any modification of the engine selected that may be required during FY 58 will not be of such a nature as to be chargeable against P-100 funds. A total of 4 million dollars in this category is requested. Development of an injector plate to give improved performance has been financed partially under the Vanguard program, and is expected to be completed by FY 57 funding under the US IPE program. A portion of the P-300 funds stated above will be expended in the modification of the Vanguard engine to accept this new injector plate and in the qualification testing of the engine with this modified injector. The above amount also includes funds for the purchase of four (4) ground test engines and five (5) flight rated engines, including acceptance testing of the powerplants prior to delivery.
1.15 million dollars of R-200 funds are required for ground equipment for testing the propulsion subsystem, both at the contractor's plant and at the flight test base.

The above program will permit no support to be given to the development of an advanced engine for the advanced vehicle.

III. Auxiliary Power Supply. The allocation of 0.5 million dollars of R-600 funds to the auxiliary power supply will be sufficient to accomplish the research and development work required for the primary batteries for the pioneer vehicle and the storage batteries to be used in conjunction with the radioisotopes and solar power supplies. It is expected that the reactor and the radioisotope power supply development will be financed in toto by the Atomic Energy Commission, and therefore, the funds in these areas would only be indirectly affected by the allocation of funds within the US 117 program. With the allocation proposed, work on the solar power supply will be carried on only at the component research level and no system development will be possible. This approach to providing electric power is the most attractive of all from an operational point of view in that it has potentially unlimited life and does not give off radiations that constitute a hazard either to personnel or to the film used in the visual reconnaissance version. Curtailment of work on this approach increases the possibility that no power supply of extended life will be developed which is compatible with the visual system. Should this be the case, continued dependence on batteries will be required with the resultant higher operating cost. With the funding proposed, no work will be possible on a chemical auxiliary power supply.

0.45 million of R-100 money in this subsystem is required for the purchase of batteries for ground and flight test work.

The 0.8 million dollars in R-200 funds is required to finance the purchase of reactor power conversion test equipment, including simulated reactor heat sources, mercury and sodium test rigs, heat exchangers, turbo-machinery, pumps and controls and other ground test equipment required to test and evaluate the equipment to be produced under the ARI funded program.

IV. Guidance and Control. A total of 1.5 million dollars of R-600 funds has been allocated to the guidance and control subsystems. These funds will be devoted towards continuing the design and development work on the present guidance system (based on the use of the inertial platform being developed under the IRRU program), the autopilot for the orbiting nose cone, the orbital stabilization system, and the guidance computer. No design or development work will be possible on the light weight
"Skipper" ascent guidance platform. This latter approach promises a weight saving of about 300 pounds which could be converted to payload, or a simplification of the system which would give higher ultimate reliability and increased accuracy. This increase in accuracy would be reflected in more precise locations of reconnaissance points, and improved resolution due to improved image motion compensation.

The 1.3 million dollars of P-100 funds will be for the purchase of four (4) ascent guidance units, four (4) transition computers, four (4) orbital stage autopilots.

The 0.712 million dollars of P-200 funds shown in the breakdown for the guidance and control subsystem would be spent for ground equipment for the calibration and checkout of the inertial platform and for simulators to test the guidance and control equipment.

V. Visual Subsystem. It is estimated that approximately two million dollars ($2,000,000) of P-600 money would be allocated to the Visual Reconnaissance Subsystem under this budget. This amount will limit the approach to a single preselected effort. Development will be concentrated on a strip film camera having approximately 6 inch focal length, an airborne film processor and the Kinexcel type of readout equipment using a flying spot scanner. Technical details of this equipment would be substantially as described in the Development Plan of 2 April 1956. Little or no work will be done on the high resolution system, embodying the 36 inch focal length lens, on improvised film, particularly those compatible with nuclear radiation, on television type read-in systems, on electrostatc tape, or other types of recording systems. The television system provides greatest compatibility with the reactor power supply. The reactor type of power supply is that which at the present moment, at least, offers the greatest assurance of success. The reduction of funds in this area to the amount stated above will increase the risk of having no visual system available which is compatible with the reactor type of power supply. This would increase the dependence on short life battery powered photography systems for at least an additional year of operation. Such systems would require expenditure of from 5 to 10 times as many vehicles as those using long endurance solar or nuclear electric power to accomplish the same reconnaissance mission. This, of course, would result in increased operational costs in the event that it was found necessary to go into extensive use of the battery powered vehicles.

0.2 million dollars of P-100 funds will be required for the purchase of three (3) test models of visual equipment beyond the prototype model for test on the ground, in aircraft, balloons and for component flights in early vehicles.
0.48 million dollars of P-600 funds will be required for the procurement of specialized ground support, photo processing and test equipment.

VI. Perfor Subsystem. Approximately one hundred thousand dollars ($100,000) of P-600 funds will be allocated to the electronic reconnaissance subsystem. This amount of money will limit development work on this subsystem to requirement study, design and ground test of modified standard components.

0.25 million dollars of P-600 funds will be required for the procurement of ground test equipment and ground simulation equipment for the establishment of the proper ground environment for testing of the components modified under the above paragraph.

VII. Infrared Subsystem. Under this budget program only one hundred thousand dollars of P-600 funds can be allocated to the infrared subsystem. Work in this area will have to be reduced to the determination of target emission characteristics when viewed from high altitudes, and to laboratory tests of sensing elements.

No P-600 funds will be allocated during FY 1958.

Two hundred fifty thousand dollars ($250,000) of P-600 funds will be required for ground test equipment to support the program of development financed by the P-600 money.

VIII. Ground Space Communication. A total of 3.1 million dollars of P-600 funds will be allocated to this subsystem. This is one of the most difficult and complex subsystems, and will continue to receive a high proportion of the funds, but for the same reason will take the largest cut dollarwise. A number of different approaches are possible on a reduced cost basis. A definite decision among these approaches has not been made at the present time. All have definite technical drawbacks which will lead to reduced capability and higher ultimate cost. The cheapest approach to solution of the tracking problem is to use the Vanguard "Minitrack" system. This approach reduces the security of the system because of its dependence on foreign bases. "Minitrack" requires a greater number of revolutions of the satellite to obtain a given accuracy in orbit determination. During the R-D period this is a critical element, because of the possibility of vehicle failure before the orbit has been secured. Existing Minitrack stations are not well disposed for operational orbits.

The use of modified AT/I-30-I radar for tracking is the next cheapest solution. This system requires use of a high powered transponder in the vehicle which will constitute a heavy drain on the batteries and further shorten vehicle life.
The best solution appears to be the nulling interferometer, but this approach requires the most R&D funds, takes the longest, and involves the greatest risk to success.

Adequate telemetry is a fixed requirement for any experimental flight test program and must be provided by any budget.

The ground data link for transmission of reconnaissance information is too expensive an item to be financed completely under any allocation of funds possible under the proposed ceiling. A considerable proportion of the allocation of the FY 58, near the less, will go into the initial phases of development of this particular equipment. The many environmental unknowns, however, dictate an early flight test program for visual system components. The lack of sufficient funds for complete development of the data link means that initial flight tests of visual system components will have to be made using telemetry information alone. It is to be emphasized that this data link will only transmit functional data and not pictures. This will delay our obtaining quantitative information of the photographic quality which may be expected when all of the links are in the chain.

The eventual requirement is for a command type of program. Such a program will permit concentration of vehicle battery power in a reduction of the total system work load and duty factor by eliminating the scanning of areas which are not important from an intelligence standpoint. Under the proposed budget, it will be necessary to use an interim pre-set type of program. This will probably be adequate for R&D purposes but will certainly not be satisfactory from an operational point of view.

Approximately 1.9 million dollars in P-100 funds will be required for the purchase of standard airborne electronic components including telemetry, tracking beacon or transponder and other items of airborne electronics for the flight test program.

There is a comparatively heavy requirement of 4.25 million dollars of P-100 funds for the purchase of ground support equipment for the ground space communication subsystem. These funds will be expended almost entirely in the purchase of ground elements for the tracking and telemetry functions. The exact items of equipment will depend on which of the approaches discussed under the P-600 fund allocation is to be followed.

IX. Data Processing Subsystem. A total of only 0.5 million dollars of P-600 funds has been allocated to this subsystem in line with the policy of taking good first in those areas which affect the quality rather than the quantity of the data produced. R&D work consequently on mechanical aids to permit exploiting the high intelligence producing capacity of the system will be limited to technique investigation. Hardware development
2.0 million dollars of P-200 funds are required to provide simulators and ground test equipment desired for use in subsequent years with an increased progress of P-20 on the actual data processing equipment itself. Certain standard items for the processing and cataloging of photographic films will be purchased for use in conjunction with the technique investigation previously mentioned.

3. Geophysics Project. 0.2 million dollars of P-600 funds are allocated to geophysical research on problems of environment relating to this weapon system. These funds will be expended in a design development and development of test instrumentation, to gather environmental information. Because of the many unknown questions relating to the new environment under which this system must operate, it is considered essential that this information be obtained at the earliest possible date if it is to be of any use whatsoever in the design of equipment to follow.

0.75 million dollars of P-100 funds are being requested to provide for the purchase of items of flight test instrumentation beyond the prototypes, flight test instrumentation of a standard nature, and complete Archeo-High or other similar sounding rocket vehicles for use in the geophysics program.

XI. OIL. All effort will be suspended in this project unless additional FY 58 P-600 funds are made available.
<table>
<thead>
<tr>
<th>Facility</th>
<th>Estimated Lead Time</th>
<th>End Date</th>
<th>Estimated Cost</th>
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<td>1217 Engineer modified for 1217</td>
<td>Oct - Dec 1957</td>
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<tr>
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<tr>
<td>1217 Engineer modified for 1217</td>
<td>During Count</td>
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<tr>
<td>1217 Engineer modified for 1217</td>
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<tr>
<td>1217 Engineer modified for 1217</td>
<td>Less than 14 months</td>
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<td>1217 Engineer modified for 1217</td>
<td></td>
<td>Sep 1959</td>
<td>605,000</td>
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</table>

It is assumed that the cost for these items will be funded by AEICU for these items at Patrick AFB and on the
large. These items are the AEICU costs are all 1217 facilities used as in, except the location. Design criteria
required to make a higher capable of handling in 1217 can be included during construction.

Miscellaneous support requirements at the Hualalai Station will not be required if the station is built on an existing
Air Force Field and those facilities are available. The AEICU and Code support facilities are assumed to be furnished
by the AEICU on which located.

In view of the estimated lead time from start of construction to completion, the time required for the installation
and check-out of the complex are to be contained in the facilities at Hualalai, the AEICU Intelligence Center, and at
Code C-117, together with the negotiation period for a contract for construction, these facilities must be approved
and funded for in the FY 58 IP Program.
<table>
<thead>
<tr>
<th>FY 117L</th>
<th>FY 59</th>
<th>Fund Requirements</th>
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<tbody>
<tr>
<td>F-500</td>
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<td>$26.0 Million</td>
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<tr>
<td>F-100</td>
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<td>35.6 Million</td>
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<td>F-200</td>
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<td>25.5 Million</td>
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<tr>
<td>F-300</td>
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<td>20.0 Million</td>
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</table>
a. Authorization to obligate an additional $2,000,000 beyond the $3,000,000 previously authorized for System 117L was received 7 December 1956, in TMX, HQ USAF. 

b. Letter Contract AF 04(647)-103 was let with the Massachusetts Institute of Technology on 25 Jan 1957. Work to be performed is in the Guidance and Control problem area. Funds allocated against this contract total $500,000.

c. Authority to obligate up to a total of $40,000,000 for FY 57 on the WS 117L program in TMX, HQ ARDC KDS CB-116-E, dated 15 Jan 1957, was received.

d. Subsystem Project Plans are in the process of being written and Project number and task number assignments have been established. Upon completion of the writing of the Project Plans, a revision will be made to the System Development Plan. Target date for completion of these actions is the anniversary date of the WS 117L Development Plan, 2 April 1957.

e. Inclosed is a list of project number and task number assignments made during the process of writing Project Development Plans.

f. (1) PR #57-WDD-196-I dated 22 Jan 1957 was initiated to add $5,563,000 to the Lockheed Aircraft Corporation Contract AF 04(647)-97.

   (2) OA #57-17 dated 25 Jan 1957 was initiated to transfer $320,000 to RADC for continued effort in the Data Processing and Dissemination area for WS 117L.

   (3) OA #57-15 dated 25 Jan 1957 was initiated to transfer $195,000 to WADC for continued effort in research on conversion equipment for nuclear auxiliary power units and for continued research on solar auxiliary power units for WS 117L.

   (4) OA #57-16 dated 25 Jan 57 was initiated for transfer of $422,000 to AFRC for continued research in the Geophysical Environment Area for WS 117L.
Advanced Reconnaissance System

31 January 1977

The summary of FY 1977 funds initiated on WB 117L is:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Contract/Task Number</th>
<th>Amount</th>
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<tr>
<td>Lockheed Aircraft Corporation</td>
<td>AF 04(647)-97</td>
<td>$8,563,000</td>
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<tr>
<td>Massachusetts Institute of Technology</td>
<td>AF 04(647)-103</td>
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<tr>
<td>RANDC</td>
<td>OA #57-15</td>
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<td>RADG</td>
<td>OA #57-16/7</td>
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<td><strong>TOTAL</strong></td>
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1 Incl  
   Project Number Assignment  
   1 page (SECRET)

[Signature]

CHARLES H. TERKULME, Jr., Colonel, USAF  
Deputy Commander, Technical Operations
<table>
<thead>
<tr>
<th>Project #</th>
<th>Project</th>
<th>Task #'s</th>
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<tr>
<td>P 1753</td>
<td>Airframe</td>
<td>39750 - 39767</td>
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<tr>
<td>P 1756</td>
<td>Propulsion</td>
<td>39768 - 39782</td>
</tr>
<tr>
<td>P 1757</td>
<td>Auxiliary Power Unit</td>
<td>39783 - 39790</td>
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<td>P 1758</td>
<td>Guidance and Control</td>
<td>39800 - 39811</td>
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<td>Visual Reconnaissance</td>
<td>39812 - 39821</td>
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<td>Ferret Reconnaissance</td>
<td>39822 - 39831</td>
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<td>P 1761</td>
<td>Infra-Red Reconnaissance</td>
<td>39832 - 39839</td>
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<td>P 1762</td>
<td>Ground Space Communication</td>
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<td>P 1763</td>
<td>Data Processing</td>
<td>39855 - 39862</td>
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<td>P 8728</td>
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4. The most interesting part of the program came up during the discussion period after the special topics outlined above were completed. During this period Colonel Gibbs raised the question of what contributions the Vanguard program would provide for a follow-on satellite program—particularly, contributions to the Department of Defense. Colonel Gibbs (NRL) had prepared a draft letter to the Department of Defense outlining these contributions in the areas of:

a. Upper atmosphere, geophysical environmental and design data.

b. Techniques for astronomical vehicles.

c. Hardware (off the shelf items), developed for the Vanguard program.

d. Political aspects, primarily in establishing the concept of freedom of space.

5. No real objections could be expressed to any of the claims made in the draft letter, except references to the "Advanced Reconnaissance Satellite" which were removed. However, many of the items listed as contributions in the areas of environmental data, techniques and hardware were of questionable validity insofar as NS-117L was concerned. A copy of the letter finally forwarded to DOD will be sent to NDD for information.

6. Personnel of the NRL are not at all hesitant to indicate that they fully intend to continue a follow-on program to the IHV, but are very careful to steer clear of any inference of a military application of their efforts.

7. Colonel Gibbs pointed out in a private conversation that the National Academy of Science, U.S. Committee for the IHV Technical Panel for the Satellite Program, has already made inquiries as to the best program for an IHV follow-on program. He also pointed out that the information submitted in the NDR TAM on the IHV "back-up" program was not intended to be a back-up program for the IHV, but a "follow-on" program to the IHV, and that the data submitted by the Air Force in the form of the TAM was not what the committee for Satellite programs wanted. Colonel Gibbs gave Colonel Oder a copy of a letter from T. W. Porter, Chairman of the technical panel on the Earth Satellite program which outlined the follow-on program objectives. A copy of this letter and the agenda for the NRL meeting is attached.
8. The Air Force by its own inactivity and lack of support of NS 117L is swiftly losing the initiative in an area that is its basic heritage. Not only from the standpoint of roles and missions, but from the standpoint of leadership in the development and utilization of new advancements in the field of aeronautics, astronautics, propulsion, guidance and control, electronics and the other fields of science involved in the satellite program.

9. This lack of support and loss of initiative was further born out in discussion with Lt. Colonel Abala and Lt. Colonel Jim Finton of General Pett's office. Colonel Gibb and Colonel Finton have both recommended to General Pett that immediate and positive action is necessary to counteract this impending loss of initiative. The action recommended is the establishment of a new R&D Staff section with the sole responsibility of promoting Air Force development in the field of astronautics. However, this must be preceded by a "solid-front" campaign by General Schriever, General Hitland, General Power, and others to "convince" the airplane minded Air Staff of the future importance of present Air Force leadership in this area. The word present is emphasized. The Army and Navy are both diligently working - brain washing - the NSF people, and the DOD R&D staff of their superior competence in the satellite field. The Air Force on the other hand has no staff agency assigned to even monitor the progress of the activities of the DOD in those areas. Colonel Finton cited a case where he had difficulty in getting someone to attend the meetings of the DOD Stewart Committee Meetings.

10. FY 57 and 58 funding status of NS 117L was discussed with Major Dillon and Colonel Finton. The results of the 29 November and 30 June funding letters to DCS/0 are being forwarded to LCD in a 6 March letter from General Pett.
MEMORANDUM TO GENERAL SCHRIEVER

SUBJECT: Letter on W5117-I

1. There is attached a letter on the 117L, for your signature, in answer to a letter signed by Gen Pett dated 6 March.

2. This letter strikes me as being a rebuttal to Gen Pett's letter, of the type that accomplishes nothing. In other words it is a 2,000-mile duel between staff agencies that do not agree upon the rate of progress to be assigned to a project.

3. My principle worry, however, concerns the effect of this type of exchange upon your long-range plans for the 117L, the Satellite business, and/or the role of the Air Force in space technology. I am not forwarding this for signature for the reason I believe it is time that we sit down with Gen Pett and talk over the Air Force position in this field on a high level before we "lap" ourselves on this project. I am hoping this meeting can be arranged for 29 March, during our visit, but if you happen to find this subsequent to my being in Washington, I hope you will give this consideration and meet with Gen Pett at your earliest opportunity.

1 Incl
Letter from Comdr, ARDC
to ECS/D = 8 = WDT57-70.

WHEN INCLOSURES ARE WITHDRAWN
THE CLASSIFICATION OF THIS
CORRESPONDENCE MAY BE DEGRADED
TO CONFIDENTIAL IN ACCORDANCE
WITH AER 203.1.

CHARLES H. THOMAS, JR.
Colonel, USAF
Deputy Commander
Weapon Systems
<table>
<thead>
<tr>
<th>Name</th>
<th>Ext</th>
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</tbody>
</table>

System Officers

US 117L

Director for US 117L
Assistant Director
Plans & Programming
Program Management
Resources Management
System Engineering

Facilities and Test

2 April 1957 Change
MEMORANDUM FOR GENERAL SCHLIEFEN

SUBJECT: Satellite Study

1. During the month of January preliminary design studies of a modified Jupiter capable of launching a 56° sphere into a satellite orbit were completed. The design studies contemplated the use of four stages. A Jupiter booster stage, a cluster of 10 ASP rockets for the second stage and two stages with one solid propellant rocket each would comprise the third and fourth stages. Stages 2, 3, and 4 would begin rotation approximately 20 seconds prior to separation of the Jupiter booster stage. The 56° sphere satellite would be equipped with a separation rocket and an anti-spin mechanism.

2. The investigation included a study of the lifetime of a circumterrestrial four stage unit, both with and without a final "kick" at apogee. A special case for an ascent launching 187° North through East for reconnaissance applications was investigated.

3. In addition to the consideration of a Jupiter boosted satellite, a study of a Jupiter 0 (Redstone boosted) version was made, both with and without "kick" at apogee.

cc: WDT

BRET J. KELLY
Lt Col, USAF
WD Liaison Officer

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10
FROM: Colonel [Redacted]
COLUMBUS AFB, INDIANA, INDIANA

TO: DIRECTOR OF MILITARY PERSONNEL, DCS/P
HQ USAF
WASHINGTON, D.C.

INFO: UNCLASSIFIED FROM HDS-P-11-3

FOR ATTN: 1C-3 ATTN LT COL LEHR.

COMMANDER ROBERT C. THOM, 82506, USAF,
IS CURRENTLY ASSIGNED TO THE WEAPON DEVELOPMENT DIVISION AS DEPUTY
ASSISTANT FOR WEAPON SYSTEM 117L, A HIGH PRIORITY PROJECT. COMMANDER THOM
HAS BEEN ASSIGNED TO THIS ORGANIZATION LESS THAN TWO YEARS. HE HAS BEEN
OF GREAT VALUE TO THE MD AND HIS TRANSFER FROM HIS PRESENT DUTY AT THIS
TIME IS NOT DESIRABLE. THIS OFFICER HAS THE BACKGROUND AND EXPERIENCE
NECESSARY TO THIS WEAPON SYSTEM DEVELOPMENT PROGRAM. IT IS REQUESTED THAT
THE DEPARTMENT OF NAVY BE CONTACTED WITH A REQUEST THAT COMMANDER THOM BE
EXTENDED IN HIS PRESENT ASSIGNMENT FOR ONE YEAR. IN THE EVENT THAT THE
ASSIGNMENT CANNOT BE EXTENDED, A CRITICAL HOLE WILL EXIST TO REPLACE HIM
WITH AN AIR FORCE OFFICER OF SIMILAR QUALIFICATIONS.
MEMORANDUM FOR COLONEL CHARLES H. TERRONEZ, JR.

SUBJECT: Follow-on Work for WDD

1. It is obvious from numerous technical feasibility studies that have been made, that with a relatively small additional effort (funds and facilities) beyond the ballistic missile program it is now possible to achieve the capability to place a payload of reasonable weight on the moon or to circumnavigate the moon without landing and return to the vicinity of the earth. And, if such a program were phased in at the proper time it could be achieved at no over-all increase in manpower on the part of either WDD/R-W or industrial contractors, except for a few people in the preliminary planning area. These few would have to be authorized and preliminary plans started now.

2. Rand, Convair, Aeronautronics, Systems Laboratories, and many other competent organizations have made feasibility studies of lunar vehicles. HADC and OSR have active projects underway for ultimately accomplishing this objective in phased programs. The feasibility of placing reasonable sized payloads on the moon depends first upon the availability of large thrust boosters. Various studies have proposed the use of the SM-65, AM-66 or SM-75 propulsion systems as boosters on lunar vehicles. Rand's study proposed the use of the SM-65 to put a 300# space vehicle on course and to land 50# of instrumentation. A study by Systems Laboratories, Inc. proposes a 4-stage lunar vehicle with the SM-75 as the first stage. This could put a 12,4# payload on the trajectory around the moon and return to within 1,000 miles of the earth with instrumentation such that technical information could be transmitted. HADC has also made preliminary studies for research vehicles including a lunar vehicle. This system has been designated 454L by Dr. ADC and a Development Plan has been prepared covering development of some phases and study of others. OSR has an additional program underway, first study, later development, for a research vehicle to explore the regime, 4,000 M.M. out from the surface of the earth and later for a vehicle to land on or circumnavigate the moon. The feasibility of doing this also depends upon the availability of an adequate guidance system which will also have to come from current ballistic missile systems development.

3. WDD already is involved in the satellite program which utilizes some of the hardware from the ICBM program, and I believe will become more and more involved in future programs of the type mentioned above. First, there will have to be research vehicles
and exploratory flights to gather data, then as design information is accumulated, the proper direction to take for a new Weapon System will become apparent. This may be a lunar vehicle, a communications satellite system or some other type of satellite or space vehicle. I do not feel that we should wait for a military requirement to be established. Much, of a preliminary investigative nature has to be undertaken first. I believe that the WDD/R-W complex is the best qualified to do this, particularly when components that have been developed here are often the ones that establish the feasibility. I feel that we have adequate justification in the following:

a. The ARDC mission is to maintain qualitative superiority. Within ARDC, WDD is uniquely qualified to judge the timeliness of initiating the technical developments necessary to achieve future goals. Our organization is already developing the basic hardware which will provide the first step towards a military satellite or the first flights to outer space. Moreover, WDD is the only organization which, by virtue of its experience, can most accurately assess the feasibility of taking the next step forward. I believe that these factors are recognized within ARDC and that WDD must assume a position of leadership in this area.

b. Our present organization and programs will provide the most efficient means of taking the next step. In this way the Air Force will get many of the necessary factors to pursue the necessary development at essentially no cost. A highly competent military-civilian team is already assembled which possesses the necessary knowledge and ability. The impetus to extend our endeavor exists now. As mentioned previously, the basic hardware is already under development. In addition, our program for supporting research is already established and requires only modest extension to directly support the type of programs I have mentioned.

c. Specific military requirements must be based on technology. Technology in the field of ballistic missiles, satellites and space vehicles is advancing rapidly now and is capable of greater advances in the near future. The advanced knowledge to be attained through such a program must be attained before military requirements can be intelligently stated.

(SIGNED)
LAURENCE D. KLY, COLONEL, USAF
Director, Technical Divisions
Weapons Systems

SECRET
Air Force Satellite Program


2. A chronological listing of actions or decisions to date on the Advanced Reconnaissance System and a summary of the National Security Council Paper 5520 and subsequent comments to that paper are attached as inclosures.

3. It is understood that the next meeting of the National Security Council will review the Satellite Program and that the Air Force summary of the Advanced Reconnaissance System is desired by Secretary Quarles prior to that meeting.

RECOMMENDATION

4. That the proposed memorandum for the Deputy Secretary of Defense be signed.

3 Inclo
1. Memo for Deputy Secy of Defense
2. Summary of The Advanced Reconnaissance System Development
3. Summary of the Natl Security Council Papers on Satellites

DOWNGRADED AT 12 YEAR INTERVALS AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

WD-57-02105
AFCGM-A Control No. 2040
MEMORANDUM FOR DEPUTY SECRETARY OF DEFENSE

SUBJECT: Air Force Satellite Program (S)

1. Reference is made to the Memorandum for the President from the Director of the Bureau of the Budget dated 30 April 1957.

2. Since 1944 the Air Force has been studying the feasibility and various uses of satellites. In February 1954 the final RAND report recommended that the Air Force initiate development of a reconnaissance satellite. Development was immediately started under Project 1115 and became Weapon System 117L in August 1956.

3. The National Security Council Paper NSC 5200 of May 1955 directed the Department of Defense to initiate the development of a small scientific satellite (Vanguard). It is also observed in that same paper that larger satellites, capable of carrying more scientific instrumentation, would be required for future research.

4. In his memorandum for the National Security Council on 8 May 1956, Mr. James S. Lay Jr., Executive Secretary, requested further studies on the need and feasibility of constructing and launching up to six additional satellites as recommended by the U.S. National Committee for the IGY, and the Director, National Science Foundation, and of utilizing alternative missiles to those contemplated in Project Vanguard.

5. The Air Force, recognizing that the political acceptability of the intelligence surveillance satellite is greatly enhanced by the prelude of a scientific program, has made two proposals to the Department of Defense recommending the use of the Advanced Reconnaissance System modified to a scientific satellite and equipped with appropriate geophysical instrumentation. The gross weight of such a system on orbit would be approximately 4,500 pounds with a payload of 1,500 pounds. This Atlas boosted satellite could be available in approximately 18 months from go ahead and would utilize a considerable amount of development effort already applied to the Advanced Reconnaissance System. Cost estimates submitted to the Department of Defense in February 1957 totaled $91,130,000 for development and launching of six satellites.
6. Any future satellite program must incorporate major improvements over the present 20 pound Vanguard. The Air Force can produce such a system within a relatively short time. A scientific satellite of similar external design to the Advanced Reconnaissance System will provide very valuable information for future weapon system development and operation of all space vehicles. The planned Advanced Reconnaissance System test program includes the firing of test nosecones to obtain environmental data. These will be essentially scientific satellites which must necessarily precede the full-scale operational program.

7. Satellites are a new form of Air Power. As the Air Force has pioneered this program and has the equipment, background and experience in missile development, it is strongly recommended that the Air Force be assigned exclusive development and operation of all future satellite systems.

8. A summary of the actions and decisions to date on the Advanced Reconnaissance System is attached as Inclosure No. 1. A summary of the National Security Council Paper NSC 5520 is attached as Inclosure No. 2.

2 Incls
1. ARS Summary
2. NSC 5520 Summary
SUMMARY OF THE ADVANCED RECONNAISSANCE SYSTEM DEVELOPMENT

1. The concept of using a satellite as a platform for reconnaissance equipment can be considered as the natural outgrowth of the requirement for obtaining intelligence information of a potential enemy whose area and security preclude its effective collection by ordinary aerial reconnaissance or other means. The need for timely and continuous intelligence information to assess a potential enemy's capabilities and probable intent has become more critical as the advancement of technology has given them offensive weapons with intercontinental range and greater destructive powers. The impetus which motivated the military establishment to foster work on new methods for collection of intelligence information came from the realization that current, reliable, prehostilities intelligence information is required to insure proper direction of National Planning in development of effective counterforce weapons and counterforce strategy.

2. The results of the numerous studies conducted since 1946 concluded that a Satellite Intelligence System was feasible and would satisfy, to a great extent, the requirements for intelligence information to aid the national planners in making decisions.

3. The concept of the Advanced Reconnaissance System is a result of studies conducted at the Rand Corporation. A study completed in 1947, together with similar investigations by other contractors, concluded that a satellite vehicle was feasible as a reconnaissance vehicle but not as a weapon carrier. In 1950, the Research and Development Board vested satellite custody in the Air Force, and Rand was directed to explore its possible military utility.

4. The following is a chronology of the events in the satellite program to date:

   a. 1946-47 - Rand Study developed the concept of the satellite as a reconnaissance vehicle but not as a weapon carrier.

   b. 1947-1953 - Further studies by Rand.

   c. 1948 January 16 - General Vandenberg issued a Statement of Policy for a Satellite Vehicle stating that Research and Development will be pursued as rapidly as progress in the Guided Missile art justified and requirements dictate.
d. 1950 - Research and Development Board vested satellite custody in the Air Force.

e. 1951 - Rand made further recommendations for reconnaissance applications in their report (RAND - 217, April 1951).

f. 1951 - Feasibility studies for critical subsystems initiated for Television (RCA), altitude control (North American Aviation), and Nuclear Auxiliary Power Units (Bendix Aviation, Frederick Flader, Allis Chalmers, and Vitro Corporation).

g. February 1954 - Final Report by Rand (Rand 292) recommending the development of the Advanced Reconnaissance System.

h. 27 November 1954 - The ARDC published System Requirement No. 5.

i. 16 March 1955 - General Operational Requirement Number 80 was published.

j. March 1955 - Design study proposals were solicited from selected contractors. Those solicited were the Lockheed Aircraft Corporation, the Radio Corporation of America, Glenn L. Martin Company, and Bell Telephone Laboratories. Bell Telephone Laboratories declined to submit a proposal.


l. 21 May 1955 - Joint Chiefs of Staff Comments on NSC 5520 (JCS 1899/208).

m. 17 October 1955 - ARDC revised System Requirement No. 5.

n. 14 January 1956 - The Western Development Division of the Air Research and Development Command completed a proposed Development Plan for a Scientific Satellite System capable of being launched during the International Geophysical Year. Cost of launching six satellites was estimated to be $95,500,000. Plan was submitted to DOD.

o. March 1956 - Design studies culminated in three separate and distinct development plans. The Lockheed proposal was considered to meet the requirements most satisfactorily.
p. 3 April 1956 - The Western Development Division of the Air Research and Development Command completed a Development Plan for Weapon System 117L, the Advanced Reconnaissance System.

q. 8 May 1956 - Memorandum for the National Security Council, subject: "NSC 5520" by James S. Lay Jr., Executive Secretary.

r. 24 July 1956 - The Development Plan for WS 117L was approved by Headquarters USAF.

s. 3 August 1956 - Development Directive 85 was issued on WS 117L. $3,000,000 of FY-57 P-600 Funds made available to ARDC to initiate development.

t. 17 August 1956 - ARDC System Development Directive was issued.

u. October 1956 - Lockheed Aircraft Corporation was awarded a development and test contract (AF 04(647)-97). Massachusetts Institute of Technology was awarded the contract for Research and Development of the WS 117L Guidance and Orbital Altitude Control Equipment in Contract AF-04(647)-101.

v. 10 December 1956 - Guidance letter was sent to ARDC following a briefing presented to Mr. Quarles on 29 November 1956. An additional $2,000,000 was programmed to raise the total to $5,000,000 of P-600 funds for FY 1957. ARDC was told to continue development and testing of all component items and not to plan to launch this system prior to FY 1961.

w. 21 December 1956 - The Assistant Secretary of Defense (R&D) stated the Air Force requirement for a nuclear auxiliary power source for WS 117L.

x. 8 January 1957 - Release of an additional $5,000,000 FY 57 P-600 was made to raise the total to $10,000,000.

y. 11 February 1957 - At the request of the Assistant Secretary of Defense (R&D) the Air Force submitted new cost estimates and time schedules for the development and launching of a Scientific Satellite modified from the WS 117L Advanced Reconnaissance System. The plan included estimated costs of $91,130,000 for development and launching of six scientific satellites. The proposal, based on the removal of reconnaissance equipment and the installation of geophysical instrumentation, stated that it would be possible to make at least two test launches during the International Geophysical Year.
s. 4 April 1957 - Memorandum for DCS/M from Mr. Horner stating that the Secretary of the Air Force has approved placing P-100 funds on the ARS.

a.a. 15 April 1957 - $3,900,000 of FY 57 P-100 funds released to WS 117L.

b.b. 15 April 1957 - The ARDC and WDD submitted the funding estimates for WS 117L for the next three years in millions of dollars as follows:

<table>
<thead>
<tr>
<th></th>
<th>FY-58</th>
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<th>FY-60</th>
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<tr>
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<td>$19.87</td>
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<tr>
<td>TOTAL</td>
<td>$46.89</td>
<td>$119.0</td>
<td>95.0</td>
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</tbody>
</table>

c.c. 29 April 1957 - Discussion with Mr. Holaday, Deputy Assistant Secretary of Defense (R&D) on Air Force Satellite Program. Mr. Holaday was briefed on the Air Force spending for FY-57 and the proposed program costs for FY-58, FY-59, and FY-60. Discussion also included some remarks on the Scientists request for an improved Vanguard satellite program for 30 vehicles to be launched from Point Mugu, California, as a follow-on program to the present International Geophysical Year satellite program.

d.d. 1 May 1957 - A revised ARDC-WDD Development Plan for WS 117L dated 2 April 1957 was received in this Headquarters.
SUMMARY OF THE NATIONAL SECURITY COUNCIL PAPERS ON SATELLITES

1. NSC 5520, May 1955,

   a. The NSC 5520 directs the Department of Defense to develop the capability of launching a small scientific satellite by 1958, with the understanding that this program will not prejudice continued research directed toward large instrumented satellites for additional research and intelligence purposes, or materially delay other major Defense programs.

   b. The paper points out the technical, prestige and psychological benefits that may be derived from establishing small scientific satellites and the activities of the USSR in this area. It goes on to state that the U.S. should emphasize the peaceful purposes of the launching of such a satellite, although care must be taken as the project advances not to prejudice U.S. freedom of action (1) to proceed outside the IGY should difficulties arise in the IGY procedure, or (2) to continue with its military satellite programs directed toward the launching of a large surveillance type satellite when feasible and desirable.

   c. This paper further points out that from a military standpoint, the Joint Chiefs of Staff have stated their belief that Intelligence applications strongly warrant the construction of a large surveillance satellite. While a small scientific satellite cannot carry surveillance equipment and therefore will have no direct intelligence potential, it does represent a technological step toward the achievement of the large surveillance satellite, and will be helpful to this end so long as the small scientific satellite program does not impede development of the large surveillance satellite.

   d. The Financial Appendix outlined the estimate of costs of the scientific satellite as:

   Satellite Vehicle ........................................... $10 - 15 million
   Instrumentation for Tracking ................................ $2.5 million
   Logistics for Launching and Tracking ...................... $2.5 million
   TOTAL .......................................................... $15 - 20 million

It also stated that these estimates include exploratory studies for a back-up program based upon the "Atlas" Missile and "Aerobee" research rocket development.
2. In follow-on correspondence on this subject in a memorandum for the National Security Council by James S. Lay Jr., Executive Secretary, dated 8 May 1956, he stated that at the NSC meeting of 3 May 1956 the NSC 5520 policy was reviewed and that it is not in the national security interest (1) to cancel the program, or (2) to slow down the program, missing the IGY. Also, that the policy in NSC 5520 would be continued with the understanding that the program would not interfere with the ICBM and IRBM. This paper also requested the Department of Defense to submit a report on NSC 5520 not later than 1 October 1956; including a report on further studies of the need and feasibility of constructing and launching up to six (6) additional satellites as recommended by the U.S. National Committee for the IGY and the Director, National Science Foundation, beyond the six (6) currently programmed by the Department of Defense, and of utilizing alternative missiles to those contemplated in Project Vanguard.
MEMORANDUM FOR:  Col. C. H. Terhune

MAY 9 1957

SUBJECT: Ability of Aircraft Laboratory of WADC to fulfill MDR requirements.

1. On 2 May, MDR was visited by Mr. Carl Reichart of the Aircraft Laboratory, Wright Air Development Center, and Col. L. D. Ely, MDR. Mr. Reichart was quite concerned about the ability of the Aircraft Laboratory of WADC to fulfill the requirements placed against them by MDR.

2. In a letter to WADC, 28 February 1957, MDR requested WADC to provide qualified technical personnel to:

   a. Serve as advisory technical monitor, through the WS 117L project office, of the system prime contractor, his subcontractors and associate contractors.

   b. Provide technical consultants to the WS 117L project office as required.

   c. Maintain timely and complete knowledge of the direction of effort, the planned technical program and the progress in the WS 117L subsystem areas.

   These services were requested in the Vehicle, Propulsion, Auxiliary Power Unit, Visual Reconnaissance, Infrared Reconnaissance, and Ferret Subsystems. WADC Laboratory Personnel were named in the subsystem project documents as technical advisors in these areas. Mr. S. W. Dunham was specifically named from the Aircraft Laboratory.

3. During his visit, Mr. Reichart stated that he was concerned about the Aircraft Laboratory competence to provide this service. His concern stemmed from the fact that WDA has not been in on the WS-107 or WS-315 programs, and has not followed the development and analysis techniques in the ballistic missiles in general. In view of this (plus the fact that WADC has made no attempt to collect the data that is available on this from MDR, R-W, Convair, Martin and Douglas) Mr. Reichart doubted the competence of WADC Aircraft Laboratory to provide the technical assistance requested in the Airframe Subsystem.

   h. There are several alternate sources for this assistance; i.e.,

   (1) MDR currently has a call contract with the University of Michigan which could be expanded to provide assistance in certain problem areas.
2. We could approach Holloman Air Development Center for the assistance required in this, the Airframe Area.

3. We could, through negotiation obtain this assistance from the Aerodynamics and Structures people of B-W. These alternate sources are listed in what we believe is the order of preference.

5. This memo is not intended to request a decision but to inform you of a problem area which will, in the near future, require considerable matching.

[Signature]

[Name]

Colonel, USAF

Director, W 117L
MEMORANDUM FOR COLONEL TERENCE

SUBJECT: VANGUARD

1. Informal information reaching WDD has indicated that the Navy VANGUARD Program is in serious trouble, particularly with respect to availability of adequate power plants.

2. The inclosed Memorandum for General Schriever (Inclosure 1) dated 19 April 1957, transmitted by Lt. Col. Kelly from Huntsville, indicates that ABMA is probably planning to exploit this situation in a manner which would tend to lead to further unfortunate dissention between the Armed Services of the United States, and provide a means for dissemination of vast quantities of misleading propaganda which might ultimately adversely affect WDD.

3. In the interests of exploring potential means to aid the Navy in its apparent unfortunate dilemma, WDTI requested R-W to briefly study the possibility of substituting the THOR plus elements of the X-17 for the original configuration developed by the Navy program. The inclosed study (Inclosure 2) is the result of this request. In spite of its superficial nature, it tends to confirm the belief of WDTI that a successful orbiting-satellite-configuration could be made available in time to meet the commitments of the Navy project.

4. It is suggested that in order to avoid embarrassment to the United States with regard to its satellite commitments for the IGY, aid the Navy in a difficult predicament, and prevent placing ABMA in a position which would probably not be in the best interests of the United States, the following plan be considered:

a. This study (Inclosure 2) be released to the Navy and discussed with appropriate authorities to assure that its potentialities are understood;

b. If Navy desires to proceed further, that it be informed that arrangements can be made to release THOR, SERGEANTS and RECRUITS as specified for the Navy at times mutually agreed upon.

c. That the Navy VANGUARD Project should be responsible for the design of required connecting structures between these stages, staging gear, etc.; for the assembly of the complete missiles; and for the conduct of the launching program.

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10
UNCLASSIFIED

FROM AIDED-SS 57017 REFERENCE TELECON 31 JANUARY 1957

BETWEEN COLONEL OBER AND YOUR HEADQUARTERS MAJOR DILLON THIS
HEADQUARTERS AND TO PRELIMINARY DEVELOPMENT FOR WS 117L DATED
14 JANUARY 1957.

INFORMATION REGARDING POSSIBLE USE OF WS 117L FOR INTER-
ATIONAL GEOPHYSICAL YEAR HAS BEEN REQUESTED BY DEPARTMENT OF
DEFENSE. REQUEST FOLLOWING QUESTIONS BE ANSWERED
A. WHAT IS COST TO DEVELOP IGY SATELLITE NOSE CONE
B. WHAT IS ORBIT AND PAYLOAD
C. WHAT IS ESTIMATED TOTAL COST OF PROJECT FOR SIX LAUNCHING

PAGE TWO RJEPEQ 869

REQUEST AS SOON AS POSSIBLE
BET
01/17/57 FEB RJEPEQ
MEMORANDUM FOR COLONEL TERRYNE

SUBJECT: Visit to Missile Systems Division, Lockheed Aircraft Corporation, 30 January 1957

1. On 30 January 1957, the undersigned with Lt Colonel Q. A. Riepe visited MSD/LAC and discussed WS 117L management problems with Mr. J. H. Carter and Mr. R. M. Salter, Jr. of MSD.

2. We discussed the need for preparing new material for a planned series of high level briefings on the ABS. I emphasized that these briefings should show to those hearing it just what ABS was going to do for them and give them confidence that it could and should be done that way. An initial outline was developed which would serve as basis for planning graphic material including possible animated film sequences. A course of action for Lockheed in support of this matter was agreed upon.

3. I advised Mr. Carter of the recent FY 58 fund request (hand-carried by General Schriever) and of the alternate course of action that had been considered. We told him where our request for FY 57 P-100 and P-200 funds stood. Mr. Carter asked for a basis on which LAC could plan their future effort on WS 117L and I advised him that as soon as we could we would send him a letter with as much information as we could provide. We discussed possible funding (in millions of dollars) as follows (Column "A" is Lockheed's view as set forth by Carter; "B" is our present WDD programming and planning figures):

<table>
<thead>
<tr>
<th>FY</th>
<th>A</th>
<th>B</th>
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<tbody>
<tr>
<td>57</td>
<td>16.5</td>
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<tr>
<td>58</td>
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<td>47</td>
</tr>
<tr>
<td>59</td>
<td>70</td>
<td>85</td>
</tr>
</tbody>
</table>

"Not all these funds go to LAC - some for GFE, some to Centers"

4. We then discussed the present MSD organization for WS 117L. Inclosure 1 is the present organization as MSD (Carter) presented it. Inclosure 2 is, in my opinion, the actual present organization on a "working basis". Actually, this organization is poorer than that which existed before the "LA-Weapons System Manager" was established since it was than a homogeneous division of the MSD Research Branch with only the Vehicle Department on a "dashed line" from the Engineering Branch. The fundamental reason (as I told Carter) why the set-up stinks is that he has responsibility but insufficient authority. When I told me that these various departments from the "functional" branches of MSD (Research, Engineering, etc.) would have "permanently" assigned personnel and would be physically collocated with his people I told him that all this meant to me was that these people should be administratively part

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of his organization. Apparently this goofed-up arrangement which tries to straddle the fence between a functional and a project organization was directed by someone higher than Mr. Root, the General Manager of MSD and appears to be a device to protect the organisational and political positions of Ridnour and Hawkins. Carter told me he had an "agreement" with Ridnour to the effect that he, Carter, controlled the Research Branch people involved.

I replied that this wasn't a very sound basis for an effective organization. Root has told Carter that the office of the IA-WS Manager could have between 10 and 50 people and at present Carter is negotiating for some 32 people. I surmise that Carter doesn't like the deal but was told to defend it. Stan Burris is the Manager of IX Weapons System which is the POLARIS Project. I was told he didn't like his set-up. Carter asked that we give them a chance to make it work before taking this up at a higher level. I don't agree with him because I'm afraid that before we would be sure it was or wasn't working we could be in a very serious trouble. It was apparent to me (after a visit to the project shop at Sunnyvale) that the MSD HS 117L organization is confused and not getting much accomplished. No doubt some of this is due to our inability to give them a clear basis for planning (largely due to present unknowns in the non-P-600 area) but much more it is due (by their own admission) to uncertainties in their own organization and direction. I'm sure that Carter did all he could to set the thing up properly and I suspect that Root agreed with him but the present deal resulted from certain persons going over Root's head to the corporation.

5. Recommendation: In view of our past difficulties with MSD because of their "split" organization (which have been documented) and because of anticipated future difficulties, I recommend that this matter be brought to General Schriever's attention with the recommendation that this organisational problem be properly straightened out with the President of Lockheed. It should be noted that the present organization does not measure up to the Lockheed Management Proposal as quoted in Enclosure 3 which was strengthened verbally by Mr. Ribbord and Dr. Ridnour at the Contractor Evaluation Board hearings which resulted in recommending Lockheed over RCA and Martin.

3 Incls
1. LAC Organisational Chart
2. LAC Organisational Chart
3. Extract MSD 1593, LAC Summary Planning Data,
2 pp (SECRET) WDTR 57-26
The departments with a parenthesis after them ( (E), (R), (M) ) denote departments which are assigned organisationally to the Research, Engineering and Manufacturing Branches of MSD and which are under the “technical control” of XA WS Mgr.
null
3. ORGANIZATION

A project organization will be established within the Research Branch of the Lockheed Missile Systems Division to handle the Pied Piper Project. Lockheed has achieved considerable success with this type of organization on previous occasions. The XP-80 and the XP-101 programs are examples. These programs were successful because:

1. The Project Manager was allowed to draw on the manpower and facility resources of the entire corporation.
2. The project organization was kept flexible and responsive directly to the needs of the project.
3. The Project Manager, and particularly the key people directly under him, were given the authority and responsibility and had the experience and judgment necessary to make sound decisions rapidly.
4. Customer's decisions were expedited usually through a single competent service project office which had full responsibility and authority to make them.
5. Administrative details, standardized procedures, etc., whether Lockheed-generated or customer-generated, were not allowed to delay the project.

The lessons learned from this experience will be applied directly to the organization of the Pied Piper project. Figure 3-1 compares the manpower build-up and the first flight dates for the XP-80 and the XP-101, with those for the proposed Pied Piper schedule. Manpower requirements are higher for the Pied Piper because of the major difference between flight-tests with
missiles and those with aircraft. In the case of aircraft, the first
flight-test article can be used for repeated development-test-flights;
thus one or a very small number of such initial flight-test articles is
required. For missiles, one test article is needed per test flight.

Because of the accelerated nature of the proposed program, the
detailed organization will be kept very flexible, so that it can respond
rapidly to the changing requirements of the program. This will be parti-
cularly important in the early phases of the work, when a close working
relationship with the Western Development Division is of critical importance.

Biographies of some of the key personnel available for this program
are given in Appendix A.
SECRET FROM WDTN 2-2-E FOR RDGOW PERSONAL FOR GENERAL PURPOSE

PLEASE TRANSMIT TO GENERAL PUTT AS SOON AS POSSIBLE PD AT THIS DATE THE
MOST LOGICAL APPROACH TO ACHIEVE A WS 117L SATELLITE CAPABILITY FOR
GEOPHYSICAL PURPOSES IS REPRESENTED BY THAT PROGRAM DESCRIBED IN WDD
LETTER SUBJECT QUOTE FUND REQUIREMENTS FOR WEAPON SYSTEM 117L
PROGRAM DATED 21 NOVEMBER 1956 AND WDD LETTER SUBJECT QUOTE PLANNING
AND FUNDING REQUIREMENTS FOR WS 117L DATED 30 JANUARY 1957 PD THIS
PROGRAM IS EXPECTED TO ACHIEVE AN ORBITAL CAPABILITY ON THE SCHEDULE
INDICATED IN WDD LETTER OF 30 JANUARY 1957 PD ON THIS PROGRAM THE
FIRST ORBITAL CAPABILITY IS CURRENTLY SCHEDULED IN OCTOBER 1959 PD.
HOWEVER COM IT IS POSSIBLE THAT THE FIRST TWO TEST LAUNCHINGS PAREM
IN 1958 PAREM COULD BE ORBITAL ATTEMPTS WITH A LOW ORDER OF
CONFIDENCE PD PARAGRAPH THE FOLLOWING LETTERED PARAGRAPHS REFERENCE
QUESTIONS A THROUGH D OF THE REFERENCED TX CLE QUESTION A PD THE
COSTS TO DEVELOP A SATELLITE BOSE COME FROM THE PRESENT STATE OF

WDTN

Lt. Colonel Q. A. Riepe
1243
1

/s/ QUEEN A. RIEPE
Lt. Col., USAF
B. A. SCHREIIVER
Major General, USAF
Commander

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INTERVALS. NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

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WDTR 57-33
DEVELOPMENT OF BUT NOT INCLUDING THE LAUNCHING OF THE SIX IY
ORBITAL ROSE CONES ARE CLEAR

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<td>TOTAL COST TO ACHIEVE ORBITAL CAPABILITY</td>
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These costs do not include those R&D costs necessary to modify the
WS 117L for geophysical purposes since these requirements are not
known CEM and do not include the cost of development CEM fabrication
and test of the geophysical instrumentation PD QUESTION 3 PD THE
ORBIT OF THE GEOPHYSICAL SATELLITE WOULD BE A THREE HUNDRED MILE
ALITUDE LOW LATITUDE PARES THIRTY FIVE DEGREES NORTH TO THIRTY
FIVE DEGREES SOUTH MAXIMUM LATITUDE PARES ELLIPICAL ORBIT WITH
ECCENTRICITY OF POINT ZERO ZERO ONE PD QUESTION C PD ESTIMATED TOTAL
COSTS OF THE GEOPHYSICAL PROJECT FOR SIX ORBITAL LAUNCHINGS ARE CLEAR
<table>
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</tr>
<tr>
<td>Six SM 65 Boosters</td>
<td>14.40</td>
</tr>
<tr>
<td>Six Satellite Nose Cones (less geophysical equipment)</td>
<td>9.00</td>
</tr>
<tr>
<td>Launch Crew Costs</td>
<td>1.50</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td><strong>91.13</strong></td>
</tr>
</tbody>
</table>

It is assumed that the costs of development and fabrication of geophysical equipment, SM 65 personnel training and SM 65 equipment technicians participating in launchings would be borne by the Vanguard program. Question D-1: PD all launchings in the test vehicle program to achieve orbital capability use the SM 65 as a booster. PD the above costs do not include the geophysical instrumentation or the costs of ground servicing and test equipment for the geophysical payload. PD question D-4: PD the Atlas booster WS 117L satellite cannot be launched from present or modified Vanguard facility PD launching the WS 117L satellite on any IGY.
PROGRAM WILL CAUSE INTERFERENCE WITH THE IVM PROGRAM PD WHETHER
THIS DEGREE OF INTERFERENCE WOULD BE ACCEPTABLE WOULD DEPEND UPON
STATUS OF THE IVM PROGRAM AND RELATIVE PROGRAM PRIORITIES PD
MODIFICATION OF SM 65 LAUNCH FACILITY AT APMC IS A PART OF THE
PLANNED VS 117L PROGRAM AND COSTS ARE ESTIMATED AT TWO HUNDRED FIFTY
THOUSAND DOLLARS PD QUESTION D-5 PD LAUNCH FACILITY OPERATIONAL
COSTS PAREN DEFINED AS COSTS INDICENT TO BASE OPERATION AND
MAINTENANCE PAREN FOR AN EIGHTEEN MONTH PERIOD ARE NOT AVAILABLE AT
THIS TIME PD QUESTION D-6 PD THE VANGUARD QUOTE MINTTRACT QUOTE
TRACKING SYSTEM CAN BE UTILIZED IF DESIRED CRM BUT THE LOW ORDER
DATA ACQUISITION CAPABILITY OF THE QUOTE MINTTRACT QUOTE SYSTEM IS
NOT COMPATIBLE WITH THE HIGH VOLUME DATA GATHERING CAPABILITY OF A
ONE THOUSAND FIVE HUNDRED POUND GEOPHYSICAL PAYLOAD PD THE COST
SUMMARY TO ACHIEVE TRACKING AND DATA ACQUISITION COMPATIBLE WITH A
ONE THOUSAND FIVE HUNDRED POUND GEOPHYSICAL PAYLOAD IS CLM

<table>
<thead>
<tr>
<th>COST ITEM</th>
<th>MILLION $</th>
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</thead>
<tbody>
<tr>
<td>DEVELOPMENT OF GROUND SPACE COMMUNICATIONS</td>
<td>3.60</td>
</tr>
<tr>
<td>INCLUDING TRACKING AND DATA ACQUISITION EQUIPMENT</td>
<td></td>
</tr>
<tr>
<td>EQUIPMENT PROCUREMENTS</td>
<td>8.30</td>
</tr>
<tr>
<td>TRACKING AND DATA ACQUISITION FACILITIES</td>
<td>4.60</td>
</tr>
<tr>
<td>TOTAL</td>
<td>15.50</td>
</tr>
</tbody>
</table>

QUESTION D-7 PD OPERATING COSTS PAREN DEFINED AS COSTS INDICENT TO
BASE OPERATION AND MAINTENANCE PAREN FOR TRACKING AND DATA ACQUISITION
STATIONS FOR EIGHTEEN MONTH PERIOD ARE NOT AVAILABLE AT THIS TIME PD
QUESTION D-8 PD ORBIT COMPUTER EQUIPMENT IS AN INTEGRAL PART OF THE TRACKING AND DATA ACQUISITION STATIONS AND COSTS OF COMPUTER EQUIPMENT ARE INCLUDED IN COSTS CITED IN D-6 PD PARAGRAPH THIS OFFICE BELIEVES A WDD SATELLITE EFFORT DURING THE ICBM WOULD INTERFERE WITH ACHIEVING THE ICBM PROGRAM AT THE EARLIEST DATA PD HOWEVER CSM EARLY DEMONSTRATED SUCCESS IN THE XSM 65 PROGRAM WOULD ENHANCE THE POSSIBILITY OF REALIZING AN EARLIER ORBITAL RECONNAISSANCE CAPABILITY PD IF WDD IS TO BE DIRECTED TO UNDERTAKE THIS PROJECT CSM IT IS RECOMMENDED THE DIRECTIVE INCLUDE THE CONDITION THAT THE EARLY DEVELOPMENT OF THE SATELLITE CAPABILITY FOLLOW THE XSM 65 BOOSTER DEVELOPMENT CLOSELY DASH NOT CONCURRENTLY DASH EXCEPT IN NOW INTERFERENCE AREAS PD IF IT IS ALSO REQUESTED THAT FUNDING BE PROVIDED OTHER THAN FROM THE ICBM PROGRAM PD MANPOWER SPACE REQUIREMENTS OVER AND ABOVE PRESENT AUTHORIZATIONS WILL BE DETERMINED AFTER BETTER DETERMINATION OF THE PROBLEM PD
MEMORANDUM FOR THE RECORD

11 February 1957

SUBJECT: Telephone call from Mr. Jack Carter, Palo Alto, to General Ritland

Mr. Carter brought up a problem which was previously discussed with General Ritland having to do with Lockheed's program funding. Mr. Carter discussed this with Colonel Riepe early this morning. He stated that they are now up against the problem of "what to plan on." They have been planning their program on the basis of a development plan which indicates substantial sums of money and they are well aware of the fact that it is too high. He wanted some advice as to what they should do this year.

He suggested to Colonel Riepe that they should take some figures on a calendar year basis which are higher than, but not too far from the money already set up in the budget. Then lay out a program and start working on manpower. Assuming that they would spend $151 million this calendar year—spend what they have plus what is in the budget for '58 and '59, plus more in calendar year '58 bringing it to $222 million. This would take in the first half of '59. This amounts to something like 17% for '58 and 19% total based on the present budget. This would require that a small amount of procurement money be injected during '58. They hope for some $2 or $3 billion at the end of this year. This will keep their program going at a proper rate and is big enough so that they can accelerate at any time if necessary. Colonel Riepe approved of this plan.

Mr. Carter stated that they are putting in a plan that is a little bit more than they know they have got. This is a plan for a minimum level of effort from which they can expand. They must do some financial forecasting, manpower and facilities planning on their own. This amounts to the aggregate between now and 1960, calendar years 1957, '58, and '59, to total expenditures of about $700 million. They can get by with $340 million of procurement money and for the next year, about $140 million procurement money.

General Ritland requested that Mr. Carter continue to work through LMD and he will send in a letter confirming the above so that comparisons with LMD figures can be made.
11 February 1957

AMC (AFMC)

MCP/33E/SS/3bp

Lockheed Aircraft Corporation
Attn: Mr. Carl Hagenmaier
Missile Systems Division
Van Nuys, California

Subject: Contract AF 04(647)-97

Gentlemen:

Your Management Information Report dated 26 January 1957 pertaining to the subject contract has been received.

It is noted that your project commitments and invoicing thru 30 June 1957 amount to $13,700,000.00. The contract as presently funded provides for a maximum $3,000,000.00, and an additional funding action, which is in process, provides for an additional $5,563,000.00, or a total of $8,563,000.00.

The above amount represents the total funding on this contract thru 30 June 1957. It is accordingly requested that your Management Information Report reflect the available funds, and the Contractor is cautioned that any commitments and invoicing beyond the above-mentioned amount can be at his own risk only.

In the event additional funds are made available within FY 57, you will be immediately advised to that effect and a re-scaling of the fund projection could take place at that time.

Sincerely,

cc: Mr. McLachlin, ACO

EUGENE S. SILBERMAN
Contracting Officer
MEMORANDUM FOR THE RECORD

20 February 1957

SUBJECT: Phone Call Between Myself and Colonel Abola - 19 February

1. Congressional Committee Briefing. Colonel Abola stated that the briefing for the Mahon Committee is now scheduled for 1000 on Tuesday, 26 February.

2. 117L Funding. Colonel Abola stated that no additional funds would be made available, out of FY 57 funding for the 117L. He stated that the Air Council had deferred decision on this to the Secretary of the Air Force and he had made the decision not to put any additional FY 57 funds in the program. Colonel Abola stated that another look would be taken at the funding program in April 1957 as regards FY 1958 funding. This information has been relayed to Colonel Oder.

3. Committee Room for Congressional Briefing. Colonel Abola advised that it was planned to use Room 160 in the Capitol for briefing the Mahon Committee. He will actually inspect this room to insure that facilities for training aids are available as earlier requested by Major Stokes.

4. McCorkle's Statements. Colonel Abola wanted to know if the two papers from AFCGM, one containing a statement of what McCorkle will give to the Mahon Committee and another containing statements McCorkle plans to make before the Nagent Group, have been delivered to General Schriever. These were handcarried to WED by Lt Colonel Perry.

J. L. HAMILTON
Lt Colonel, USAF
Executive Officer

Copies furnished
General Schriever
General Ricland
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
Washington 25, D. C.

6 Mar 1957

SUBJECT: (U) Planning and Funding Requirements for WS 117L

TO: Commander
Air Research and Development Command
Post Office Box 1395
Baltimore 3, Maryland

1. Reference is made to your 1st endorsement dated 5 Feb 57 to the Western Development Division letter of 30 Jan 57, subject as above.

2. Fiscal Year 1957 P-100 and P-200 funds are already over-programmed. Items that have been retained in the present program represent critical support of the active forces. WS 117L, along with other inadequately funded programs, has recently been reviewed at the highest level and the decision made to make no changes in the program structure at this time.

3. This headquarters does not concur with the Western Development Division interpretation of the guidance from this headquarters as outlined in paragraph 2 of their basic letter. The guidance, as previously presented, was prohilitated for the purpose of emphasizing component development to insure a greater expectation of success when launchings are undertaken. The Research and Development Flight Schedule proposed in the Western Development Division basic letter of 30 Jan 57 shows no significant change over the flight schedule published in the Development Plan dated 2 Apr 56. Your staff is familiar with the Secretary's views in this regard and that resultant definite slow down is in order. Request your amended Development Plan, to be published in the near future, indicate no orbital testing prior to January 1960.

4. WS 117L must proceed with the ten million of P-600 funds presently available. Another review will be made in April to determine if 4.87 million of P-100 and 4.02 million of P-200 funds can be obtained for FY 1957. For your information the estimates under consideration for FY 1958 are as follows:

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<tbody>
<tr>
<td>P-100</td>
<td>15.0</td>
</tr>
<tr>
<td>P-200</td>
<td>10.0</td>
</tr>
<tr>
<td>P-600</td>
<td>10.0</td>
</tr>
</tbody>
</table>

DOWNGRADED AT 12 YEAR INTERVALS. NO AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

CONFIDENTIAL

WD 57-01083
5. It is envisioned that this development will be conducted along conventional lines, which dictates the need for the establishment of a WEPO within Western Development Division.

/s/ D. L. Putt
D. L. PUTT
Lieutenant General, USAF
Deputy Chief of Staff,
Development
Hq USAF, 6 Mar 57, Subj: (U) Planning and Funding Requirements for WS 117L

HQZGW
1st Ind
13 Mar 57

HQ AIR RESEARCH AND DEVELOPMENT COMMAND, P.O. Box 1395, Baltimore 3, Md

TO: Commander, Western Development Division (ARDC) ATTN: WDT, P.O. Box 262, Inglewood, California

1. Basic correspondence is forwarded for your information and necessary action. Your attention is invited to the last sentence of paragraph 3, which requests that the amended Development Plan indicate no orbital testing prior to January 1960. (SECRET)

2. Request action be initiated to establish a WSFO within WDD concurrently with receipt of P-100 and P-200 funds. (UNCLASS)

/s/ E. A. Kiessling
DON R. OSTRANDER
Brigadier General, USAF
Assistant for Guided Missiles Systems
Deputy Commander/Weapon Systems

DOWNGRADED AT 12 YEAR INTERVALS. NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10
11 March 1957

Lt General D. L. Putt
Deputy Chief of Staff/Development
Headquarters, U.S. Air Force
Washington 25, D. C.

Dear General Putt,

I recently received this memo from Colonel Asa Gibbs, and I agree with it so whole-heartedly that I'm passing it on to you with the hope that you too will concur.

...The suggestion that we integrate any follow-on scientific satellite work with the ARS program certainly makes a lot of sense to me. I don't know what the possibilities are, but I certainly feel that it should be pursued.

I also agree with his suggestion regarding organisation. I believe that a special office reporting directly to you could do much to pull together and lend emphasis to the many facets of this business, which is so important to the future of the Air Force.

Sincerely,

[Signature]

DON R. OSTRANDER
Brigadier General, USAF
Assistant for Guided Missiles Systems
Deputy Commander/Weapon Systems

1 Incl
Ltr fm USNRL to Gen Ostrander, no subj, dtd 6 Mar 57 w/l
incl
MEMORANDUM

From: Colonel A. F. Gibbs
To: Brig. Gen. Ostrander

1. Rumors became persistent sometime in the Fall of 1956 that certain scientific elements were considering an extended or continuing scientific satellite program. These rumors could hardly be overlooked since the Vanguard Program had such a marginal chance of success and furthermore, even if successful, would provide only a fraction of the scientific information desired from a satellite vehicle.

2. My considerations of an extended scientific satellite program were based on the following factors:
   a. Practically all of the information which could be obtained from such a program is information which the Defense Department critically needs in various programs and applications.
   b. The expense of conducting an extended program would be great and probably met by sacrificing some weapon systems effort.
   c. A continuing "scientific" program would become corollary and not necessarily an integral step in the logical progression to space flight.

3. The first conclusion reached after a consideration of the factors was that the ARS program should have a Phase I which would be designed to obtain the information which would come out of an extended scientific program. The thinking which developed this conclusion is as follows:

DOWNGRADED AT 12 YEAR INTERVALS: NOT AUTOMATICALLY REPRINTED CSD DUR 5209.10

AFOSR-A Control No. 607
The ARS Program would encounter no international objections in Phase I if it were clearly a scientific exercise.

The national economy would be spared the expense of an additional program.

The objections of the scientific element to a military program could be overcome by delegating to an NAS Committee the authority to stipulate the scientific experiments.

The ARS should provide a vehicle with much greater reliability and capability than the Vanguard or an improved Vanguard vehicle.

Since space flight should be a desired role and mission of the Air Force, steps leading to space flight should be under the cognizance of the Air Force. Conducting the extended scientific program by means of a Phase I ARS would ensure that this important space flight step be under Air Force management.

The second conclusion reached is that the Air Force must establish a policy and an organization to aggressively do everything necessary to insure that the Air Force obtains a predominant role in space travel.

For the past ten years work in astronautics has either been so technical or so highly classified that only a few Air Force officers have recognized that the future of the Air Force lays in this field. There is no organization in any echelon of the Air Force which has the direct responsibility of recommending policy and guiding the Air Force into a commanding role in astronautics. It must be recognized that other services and scientific elements have displayed an active interest in those projects associated with space travel. The Army has within the ADMA an element directly concerned
with obtaining for the Army any project which can be recognized as one of
the steps on the road to space travel. The Navy has a similar element in
ONR. The Air Force responsibility is scattered and an integrated effort is
not possible in the present organization. The initiative and policy in this
matter should come from the top because of the role and mission aspect. The
organization for accomplishment already exists in the WDD, ARDC, but this
organization must have policy and guidance. There should be established
within the DCS/D an office with cognizance over astronautics. This office
should not be under the Asst C/S for C.M. because the Asst C/S should be
concerned only with weapon systems.

5. Rumors referred to in paragraph 1 became fact with the publication of
a letter by R. W. Porter, Chairman, Technical Panel on the Earth Satellite,
dated 7 January 1957. (Indc.) Clearly Dr. Porter recommends a scientific
program directed by civilian scientists. The cost estimate of $130 million
dollars is, in my opinion, less than half of what such a program would cost.
A more realistic figure would be near $300 million. I believe this amount
of money is too great to obtain only a purely scientific research program
when the same end results could be obtained within the ARS program. The
program as proposed is being very favorably received in scientific circles
at a high level. Therefore, it is imperative that the Air Force initiate
action immediately to establish a policy and an organization to properly
cope with this problem.

ASA B. GIBBS
Colonel, USAF
Program Officer
Dear Dr. Kaplan:

At the last meeting of the Committee in Washington on December 5, 1956, the Technical Panel on the Earth Satellite Program was requested to study and report on a continuing program of scientific research using earth satellite vehicles. This program would consist of thirty attempted launchings spaced over a period of approximately five years. The first, second, and third stage boosters would be similar to those now being constructed for the IGY program, but design improvements would be incorporated in 'block' changes as rapidly as permitted by the state of the art. The assigned task, then, is to estimate how much improved vehicular performance might be obtained during the course of such a program and to study the ways in which such increased performance might be exploited scientifically.

Inasmuch as it did not appear to be feasible to call the entire Panel together again before early February, and inasmuch as it was indicated that a report on this study should be available not later than January 10, 1957, I have asked for assistance from several members of the Panel and of the Working Group on Internal Instrumentation as a sort of ad hoc task force. These persons include Dr. Van Allen, Dr. Healy, Dr. Kellogg, Dr. Rosen and Dr. Spitzer. The attached report should be considered as a summary of the constructive thinking of these persons rather than as an official report by the Technical Panel. I am sending copies of the report immediately to all members of the Panel and of the Working Group so that they may register any objections or dissent, if they so desire.

Although we were not asked to comment on organizational considerations, my colleagues have asked me to pass on to you the opinion that for an extended scientific program of national scope, such as appears to be contemplated here, it is important that clear civilian authority (as by the National Science Foundation) be established for the planning and execution, preserving, however, any essential cooperation of the military services. In particular, it seems important to establish at the very beginning of the program a single comprehensive budget which will include all expenditures in connection with the program, including those to be made by organizations within the military establishments.

I sincerely hope that the attached information will satisfy the purposes outlined by Dr. Barkner and yourself.

Sincerely,

/s/ R.W. Porter
R.W. Porter, Chairman
Technical Panel on the Earth Satellite
MEMORANDUM FOR: Colonel Tartumne

SUBJECT: Trip Report – Colonel Oder and Lt. Colonel Riepe to Naval Research Laboratory 12 March 1957 and Pentagon

1. The purpose of the visit as arranged by Colonel A. B. Gibbs, Air Force representative to Project Vanguard at the Naval Research Laboratory, was to exchange information of mutual interest between the IXR Satellite program and NS 117L. Those in attendance were:

Colonel Frederic C. E. Oder – WDD
Lt. Colonel Quantum A. Riepe – WDD
Lt. Colonel Paul E. Worthman – AEDC
Lt. Colonel Victor M. Jeans – AEDC
Captain (DEN) P. Paris – NRL
Mr. J. W. Siny – NRL
Mr. J. P. Hagen – NRL
Mr. F. Ferguson – NRL
Mr. H. W. Rosen – NRL
Mr. B. E. Newell, Jr. – NRL

2. The meeting convened in Mr. Hagen’s office at 0900. The following topics were covered:

Vanguard Program – Management Problems – Mr. Hagen
Vehicle – Problems and Approach for Solutions – Mr. Rosen
Guidance and Control – Mr. Ferguson
Orbital Computation and Trajectories – Mr. Siny
Scientific Experiments – Mr. Newell
NS 117L – Approach-purpose-WDD Status – Colonel Oder

3. An interesting fact of the IXR program came about as a result of questioning Mr. Hagen and Mr. Rosen on the present development status and projected schedule. They have now slipped six months in their development program. They have not flight tested any of the major components of the system, and yet intend to “make-up” the time already lost plus any additional by compressing the flight schedule to still have an end date of December 1958. The current program calls for six satellite launches in the IXR, carrying four “hard-core” geophysical experiments. Mr. Hagen stated that the NRL considered this project requirements fulfilled if one of the six established a vehicle on orbit.
5. Execution of this plan would place a very small burden upon WDD, could lead to generation of good feelings between Navy and Air Force, and incidentally, ease the burden of converting Launch Pad 18A and Blockhouse 18 to WS-315A use at the conclusion of VANGUARD firings since instrumentation and control equipment would be largely that required for operation of the THOR missile.

EDWARD H. HALL, Colonel, USAF Director, Weapon System 315A

2. Incls.

1. Cy Memo for BAS dtd 19 Apr 57 (8) WD 57-01714. All underpłat

2. Cy RW Study, dtd 1 Apr 57, Proposed Use of IHEM as Booster for Multi-Stage Vehicles (8) WD 57-01959
The accompanying data sheets cover the work done to date on three new designs using the IREM as booster for the following multi-stage vehicles:

**Test Vehicles**

1. Two-Stage Re-entry Test Vehicle \( M = 23 \) Payload 500 pounds.
2. Two-Stage Test Vehicle \( M = 25 \) Payload 0 pounds.
3. Four-Stage Test Vehicle \( M = 29 \) Payload 90 pounds.

**Satellites**

1. Two-Stage Vehicle. Payload 50 pounds. Orbit at 190 mi. altitude.
2. Three-Stage Vehicle. Payload 200 pounds. Orbit at 300 mi. altitude.

These combinations of vehicles are attained by uniting the Thor and the RTV in various stages. A brief study of the interstage connection between Thor and RTV reveals no major modifications needed to make the connection. The spin-rocket system of the RTV is also utilized in these designs (with streamlined fairings). The Thor guidance system is replaced by a simpler, lighter system for these designs. In view of the simplicity of these modifications, it is expected that the development costs involved in the above proposals will be very nominal.

The performance and payload capabilities of these arrangements seem to justify further consideration of their potential uses. Please let us know if we can be of further assistance in the development of the idea.
1. The present proposal is to assemble multi-stage rocket vehicle using the IRBM "Thor" as first stage or booster, and the T-65 as second stage. The plan appears to be feasible without extensive changes to the booster or to the T-65 (see Figs. 1 and 2). The nose cone of the Thor may be removed and the interstage adaptor attached at Sta. 50. The standard T-65 motor and spin rocket installation as used on the RTV are assumed for the second stage. Some weight saving modifications to the guidance and control equipment and power supply are assumed, and specified.

2. The payload-velocity-range characteristics of the resulting two-stage vehicle are as follows:

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<tbody>
<tr>
<td>0</td>
<td>25,400</td>
<td>-</td>
</tr>
<tr>
<td>500</td>
<td>23,300</td>
<td>5,300</td>
</tr>
<tr>
<td>1,000</td>
<td>21,500</td>
<td>4,150</td>
</tr>
<tr>
<td>2,500</td>
<td>18,700</td>
<td>2,800</td>
</tr>
</tbody>
</table>

3. The bending moment imposed on the interstage connection by the sudden application of 30 motor tip at burnout of Stage 1 is about 500,000 in.lbs applied load. This imposes a stress on the booster at Sta. 141 of 2500 psi and on the T-65 motor of 6000 psi. These moderate stresses are higher than any gust load condition would impose, but seem to indicate that the structural problems involved in the proposal would not be critical.

4. Given the IRBM booster and the T-65 motor with spin-up rocket installation as used on the RTV, the cost of assembling the two-stage vehicle is seen to be very nominal. In fact, this is the lowest cost rocket vehicle having a range of about 5000 miles which has come to the author's attention.

5. In addition to its suggested use as a Re-entry Test Vehicle for tests on a half-size nose cone of the IRBM, many other applications may be devised, such as a weapon, decoy or recon. vehicle. By virtue of the ease of adaptability from available parts, the latter possibilities should be given further consideration. Some interesting possibilities can also be obtained by use of three- and four-stage combinations of available parts.

6. A two-stage satellite vehicle capable of orbiting a payload of 50 lbs. can be obtained, by modifications to the Thor guidance, autopilot and power supply, and by use of an 18:1 expansion ratio nozzle on the T-65. With similar modifications, a three-stage satellite capable of carrying a payload of 200 lbs. can be obtained.

7. If a four-stage vehicle is assembled with the IRBM booster and all three stages of the RTV, a Mach number of M = 29 can be attained with a payload of 90 lbs. Using the low-thrust attitude-control system after Stage 1 burnout, it is possible to provide re-entry angles of 20 degrees or less with range values of about 2000 miles.
Proposed Two-Stage Rocket Vehicle
Using IRBM Booster
With T-65 Second Stage

Payload
500 lbs

Maximum Range
5,300 n mi

Stage 1 Burnout Altitude
210,000 ft

Stage 1 Burnout Velocity
12,600 ft/sec

Stage 2 Burnout Altitude
400,000 ft

Stage 2 Burnout Velocity
23,300 ft/sec

Apogee
4x10^6 ft.

Re-entry Angle
20° degrees from horizontal

Plan of Operation

Fire Stage 1. Climb vertically for 10 seconds, then programmed turn to angle of 20 degrees using programmer and autopilot mounted in Stage 1. Conventional Stage 1 controls with vernier & anti-roll to stage burnout, and for 6 seconds thereafter.

Separate and fire spin-up rockets to get 4 revs/sec.

Fire Stage 2, after separation and spin-up initiated by programmer. Spin velocity will maintain constant attitude to about 1 degree.

Separate nose cone by pyrotechnic or mechanical expulsion unit, initiated by time fuse, after burnout of Stage 2.

Nose cone has no attitude control; hence will re-enter at any angle and will tend to oscillate.

Stability, damping, temperatures, pressures and radiation effects can be measured under conditions comparable to ICBM re-entry.

Data can be telemetered to ground stations.
TWO-STAGE TEST VEHICLE PROPOSAL

The present proposal is to assemble a two-stage rocket vehicle using an IRBM as booster, with a standard T-65 motor as the second stage. This two-stage vehicle might be used as a Re-entry Test Vehicle, capable of carrying an ICBM nose cone (one-half size) weighing 500 lbs., with a re-entry Mach number of about M = 23.

The basic Thor vehicle is not changed except to remove the nose cone and replace it with an adaptor which supports the second stage (see Fig. 2). The gross weight of the two-stage vehicle is about 5000 lbs. greater than the original Thor, but the burnout velocity of Stage 1 is still about 12,600 ft/sec. with the two-stage missile carrying 500 lbs. payload. The original guidance and autopilot system is assumed to be replaced by a lighter system for such tests.

The flight plan (see Fig. 1) is to use the conventional IRBM controls and anti-roll & verniers through the boost period and for 6 seconds thereafter, then to separate and fire the second stage immediately. The RTV spin rocket system gives 4 revs/sec., which provides stability and attitude control during the second stage burning period. After burnout the nose cone separates and continues on trajectory without attitude control. Its shape is believed to provide sufficient stability to cause it to align itself with the flight direction on re-entry. Temperature effect and stability characteristics may be measured and telemetered to the ground.

The ICBM nose cone weighing 3500 lbs. consists of approximately fifty (50) percent warhead and an equal amount of shell and structure. The same deceleration would be obtained on a model in which the drag/weight ratio was held constant. For a half size model, the drag is reduced by a factor of four due to the reduction in size, and the weight should also be reduced by a factor of four, to give the same deceleration. Hence, the weight of the half size model would be 875 lbs., or of a one-third size model 390 lbs. The weight of a scale model varies as the cube of the scale; hence the half size model would weigh 1/8 of 1750 lbs. or 220 lbs., while the 1/3 size model would weigh only 65 lbs. Ample weight is then available for extra skin gage and for telemetering equipment.

The re-entry angle can be varied from values of the order of 20 degrees corresponding to the ICBM to much higher angles, by adjusting the autopilot programmer during the launch phase. The similitude conditions to be expected for the proposed Re-entry Test Vehicle are as follows:

<table>
<thead>
<tr>
<th>Similitude Condition</th>
<th>ICBM</th>
<th>Re-entry Test Vehicle</th>
</tr>
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<tbody>
<tr>
<td>Re-entry Velocity, ft/sec</td>
<td>23,000</td>
<td>23,300</td>
</tr>
<tr>
<td>Re-entry Angle, degrees</td>
<td>18</td>
<td>18 - 90</td>
</tr>
<tr>
<td>Reynolds Number</td>
<td>R₀</td>
<td>1/2 R₀</td>
</tr>
<tr>
<td>Max. Deceleration. &quot;g's&quot;</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Hearing Period, sec.</td>
<td>t₀</td>
<td>t₀</td>
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</table>
STEP IN BUILD-UP OF TWO-STAGE VEHICLE

HALF SIZE ICBM NOSE CONE
Weight 500 lbs. or more

STANDARD 13X MOTOR
Weight 8160 lbs.

SPIN ROCKET
Similar to RTV
Weight 150 lbs.
drops off after .5 sec.

ADAPTOR
Interstage Connector (200 lb)

Standard 6.13:1 Exp. Nozzle
\[ I_sp = 208 \text{ sec.} \quad \text{(High Alt.)} \]
\[ V_{ex} = I_sp \times 6700 \text{ ft/sec} \]

11:1 Expansion Nozzle
\[ I_sp = 218 \text{ sec.} \]
\[ V_{ex} = 7000 \text{ ft/sec} \]

18:1 Expansion Nozzle
\[ I_sp = 225 \text{ sec} \]
\[ V_{ex} = 7250 \text{ ft/sec} \]
Extra weight 100 lbs.

*The Standard Thor is assumed to have the following characteristics:
Empty Weight 11,635 lbs Dry
13,532 lbs Wet

Gross Weight 111,438 lbs.

Burnout velocity 14,700 ft/sec
at 400,000 ft.

Vernier control 6 sec. after burnout
Long Range Trajectories. The two-stage test vehicle can be launched on a long range trajectory of about 3000 n. mi. by tipping over to an angle of about 20 degrees near the end of Stage 1 burning period and holding that angle constant during Stage 2 burning period, which is assumed to commence about 6 seconds after Stage 1 burnout. Ground stations for this type of operation may be the same as those planned for the ICM long range trajectories. The two-stage payload is expected to impact within about 100 miles of the aiming point and its telemetering range during re-entry should be several hundred miles, hence the ICM ground stations should be within telemetering range of the re-entry trajectory.

Short Range Trajectories. In case it is desired to reduce the range of the test vehicle, one effective method is to fire the first stage, then coast to apogee and beyond using low-thrust attitude-control nozzles, then to fire the second stage on the downward leg, at whatever re-entry angle is desired, and at such altitude that burnout will occur above an altitude of 400,000 ft. This procedure will reduce the range to about 2000 miles for 20 degree re-entry angles.

Lofted Trajectories. By firing the first stage nearly vertical, and delaying Stage 2 firing until the downward leg, the range may be reduced to any small value desired. This technique is feasible by use of low-thrust attitude-control nozzles, utilizing the remaining Lox tank gas pressure. Such lofted trajectories will give rather steep re-entry angles, of course, but such may be desired for some tests. The attitude control may work in two ways:

1. Maintain the missile nose up until ready to fire Stage 2. Then separate, spin-up and fire Stage 2, which points downward.

2. Tip the missile over to nose down attitude. Then separate, spin-up and fire Stage 2. (The latter technique requires gyro capable of operation through a range of about 180 degrees change in attitude.)
WEIGHT SUMMARY AND PERFORMANCE ESTIMATE
TWO-STAGE RE-ENTRY TEST VEHICLE WITH SPIN-UP

Present weight empty of IRBM (Dry) 11,635 lbs.
Residual Propellant 1,897

Present weight empty of IRBM (Net) 13,532 lbs.
Usable Propellant 97,906

Gross weight of present IRBM 111,438 lbs.

Items to be removed
Nose cone 3,500
Structure forward Sta. 151 382
A-G guidance unit 991
Autopilot units, supports, batteries 227
Reduce size of vernier tanks 200

Items to be added
Autopilot and programmer 150
Power supply 115
Adaptor for T-65 200

Net weight of Stage 1 106,442 lbs

Add T-65 and 500 lb. Payload
Model payload and fitting 500
T-65 with standard nozzle 8160
(including 6978 lbs. propellant)
Spin-up rocket installation 150 (drop off after .5 sec)

Launch weight of Stage 1
Less usable propellant
Empty weight of Stage 1

Estimated Burnout Velocity - Stage 1 ** 270,000 ft
Velocity increment - Stage 2 = 6700 * 1.66 - 285 =
Estimated Burnout Velocity - Stage 3

\[ \frac{1}{I_{sp}} = \frac{1.309 \times 10}{6975} \times \frac{1.66}{1.494} = 208; \quad I_{sp} = g = 6700 \text{ ft/sec}. \]

(Standard 6.13:1 expansion nozzle)

\[ \frac{dv}{dt} = -0.44 \frac{\text{ft/sec}}{\text{lb}}. \text{ See Fig. 4} \]
WEIGHT SUMMARY AND PERFORMANCE ESTIMATE

TWO-STAGE SATELLITE VEHICLE

Present weight empty of IREM (Dry) 11,635 lbs.
Residual Propellant 1,897
Present weight empty of IREM (Wet) 13,532 lbs.
Usable Propellant 97,906

\[ 111,438 \text{ lbs.} \quad - \quad 5,461 \]

Gross weight of present IREM
Items to be removed
Nose cone 3,500
Structure forward Sta. 151 382
AC guidance unit 991
Autopilot units, supports, cables 161
Power converter, supports, batteries 227
Reduce size of vernier tanks 200

\[ -5,461 \]

Items to be added
Autopilot and programmer 4485
Power supply 150
Adaptor for T-65 115
Control of attitude - system* 200

\[ 106,462 \text{ lbs.} \quad 8,460 \]

New weight of booster stage
Add T-65 and Orbiter installation
Orbiter payload and fittings 50
T-65 with 18:1 nozzle** 8260
(including 6978 lbs propellant)
Apin-up rocket installation 150

Launch weight of Stage 1
Less usable propellant 114,922 lbs.
Empty weight of Stage 1 97,906

Estimated Burnout Velocity - Stage 1 12,750 ft/sec@ 275,000 ft 10,750@10^6ft.

Velocity Increment - Stage 2 = 7250**1 g - 8310 = 13,250

Earth's Rotational Velocity
Estimated Burnout Velocity - Stage 2 1,500

Required Orbit Velocity at 10^6ft. (190 mi) 25,500 ft/sec

25,400 ft/sec

*Standard vernier system (6 sec. after burnout) continues until altitude is about 350,000 ft. Long duration jetsystem may utilize LOX tank gas to turn body to horizontal and hold it for about five (5) minutes, while coasting to apogee.

\[ \text{**I}_{sp} = \frac{1.309 \times 10^6 \times 1.790}{1332} = 225; \quad \text{I}_{sp} \times g = 7250 \text{ ft/sec.} \]

(18:1 expansion nozzle)
STRUCTURAL CONSIDERATIONS

(See Figure 3)

Case 1. Consider bending moment on interstage connection due to sharp edge side gust of 60 ft/sec., applied at maximum dynamic pressure condition of $q_{\text{max}} = 800$ lbs/sq ft., Altitude = 35000 ft., Velocity = 1500 ft/sec.

Change in angle of attack $= \frac{60}{1500} = .04$ rad.

Side force on nose $= C_L qS = 2.0 \times 800 \times 4.9 \times .04$
$= 315$ lbs.

Bending moment at rear of Sgt. $= 315 \times 300$
$= 100,000$ inch lbs. (applied)

Case 2. Consider bending moment at interstage connection due to sudden application of control on the main motor. One degree tip of main nozzle gives a moment of

$N_{cg} = \frac{153,000}{57.3} \times 45 = 120,000$ ft lbs/0

Angular acceleration about the center of gravity will be

$\ddot{c}_g = \frac{N}{I} = \frac{120,000}{300,000} = 0.4$ rad/sec$^2$/0 (near burnout)

Moment at interstage connection will be

$\frac{H}{o} = I = \frac{M^2}{3} = \frac{9000}{3} \times 20^2 \times 0.4 = 14,400$ ft lb/o
$= 172,000$ in lb/o

*Present T-65 is designed for hoisting moment of 505,000 in lb.
and hence could take at least 3 degrees of motor tip.

Bending stress on Sta. 151; $f = \frac{M}{I} = \frac{500,000 \times 37}{237^3 \times .05}$
$= 2500$ lbs/sq in

This corresponds to an increase in tank pressure of about 7.5 psi.

Bending stress on rear of T-65 $= \frac{500,000 \times 15.5}{15.5^3 \times .125}$
$= 6000$ lbs/sq. in.

Reaction to resist Bending Moment $R = \frac{M}{d}$

Where $d = 36$ in. $R = \frac{500,000}{36} = 14,000$ lbs.

It is simple to carry this load on two rings of adaptor.

*For further analysis of T-65 load conditions, refer to Thiokol Report SP - 59 "Preliminary Model Spec, Rocket Motor, Solid Prop. T-65, 24-KS-50,000. SP-59". 5 July 55. (Conf.)
Fig 3
Interstage Connection - T-65 to Thor

T-65 Motor Less Fins
31" Diam.

Standard 6:13:1
Expansion Nozzle

11:1 Expansion Nozzle

Station 151 Bolted Joint 74" Diam.
Replace Thor Nose with Interstage Connector
(Joint at Station 50 - Diam. 54" Similar)

Separation of Stages: Remaining Gas in Fuel Tank May Be Dumped into Cylinder Behind T-65
PROPOSED THREE-STAGE SATELLITE VEHICLE
USING. IREML. BOOSTER
WITH TWO STAGES OF RTV

Payload 200 lbs.
Stage 2 and 3 weight 9,980 lbs., including payload.
Booster burnout velocity 12,050 ft/sec
Stage 2 9,000 ft/sec
Stage 3 5,700 ft/sec
Earth's Rotation 1500 ft/sec
Total Velocity Stage 3 23,930 ft/sec

Plan of Operation

Fire Stage 1. The vehicle then executes a programmed turn to horizontal at apogee, using autopilot. Conventional controls to burnout, with low-thrust vernier to apogee for attitude control.

Separation, Spin-up and Stage 2 Ignition. The second stage is ejected using pyrotechnic or mechanical ejector unit, initiated by programmer on Stage 1. Motion of separation causes spin-up rocket ignition. Stage 2 motor ignition, and initiation of time fuse for Stage 3 ignition.

Stage 3 Ignition. After time fuse ignites Stage 3 it is launched through guide rails attached to empty Stage 2, thus minimizing its dispersion.

Payload Separation. Depending on the purpose of the flight, payload may or may not be separated from its empty rocket case.
WEIGHT SUMMARY AND PERFORMANCE ESTIMATE
THREE-STAGE SATELLITE VEHICLE WITH SPIN-UP

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present weight empty of IRBM (Dry)</td>
<td>11,635 lbs.</td>
</tr>
<tr>
<td>Residual Propellant</td>
<td>1,897</td>
</tr>
<tr>
<td>Present weight empty of IRBM (Wet)</td>
<td>13,532 lbs.</td>
</tr>
<tr>
<td>Usable Propellant</td>
<td>97,906</td>
</tr>
<tr>
<td>Gross weight of present IRBM</td>
<td>111,438 lbs.</td>
</tr>
<tr>
<td>Items to be removed - Same as p. 7</td>
<td>-5,461</td>
</tr>
<tr>
<td>Items to be added - Same as p. 7</td>
<td>-485</td>
</tr>
<tr>
<td>Net weight of Stage 1</td>
<td>106,462</td>
</tr>
<tr>
<td>Weight of Stage 2</td>
<td></td>
</tr>
<tr>
<td>Satellite Payload</td>
<td>200</td>
</tr>
<tr>
<td>Three Recruit Cluster (including 3 x 263 lbs. propellant)</td>
<td>1,270</td>
</tr>
<tr>
<td>T-65 motor with 18:1 nozzle (including 6978 lbs. propellant)</td>
<td>8,260</td>
</tr>
<tr>
<td>Spin-up rocket installation</td>
<td>150</td>
</tr>
<tr>
<td>Launcher for Stage 3</td>
<td>100</td>
</tr>
<tr>
<td>Launch weight of Stage 1</td>
<td>116,442 lbs.</td>
</tr>
<tr>
<td>Less usable propellant</td>
<td></td>
</tr>
<tr>
<td>Empty weight of Stage 1</td>
<td>97,906</td>
</tr>
<tr>
<td>Estimated Burnout Velocity - Stage 1</td>
<td>12,050 ft/sec @ 255,000 ft 7,730 @ 300 mi</td>
</tr>
<tr>
<td>Velocity increment Stage 2 = 7250 lb 1g 8430 2852 =</td>
<td>9,000</td>
</tr>
<tr>
<td>Velocity increment Stage 3 = 7400 lb 1g 1470 680 =</td>
<td>5,700</td>
</tr>
<tr>
<td>Earth's rotational velocity</td>
<td>1.500</td>
</tr>
<tr>
<td>Estimated Burnout Velocity - Stage 3</td>
<td>23,930 ft/sec</td>
</tr>
<tr>
<td>Velocity required to orbit at 300 mile altitude 23,900 ft/sec.</td>
<td></td>
</tr>
</tbody>
</table>
Dispersion of Stage 2

Deviation from direction of launch = \( \phi = \frac{M \sin \omega t - a \sin \omega t}{A_w^2 (1 - a)} \)

where \( M \) = unbalanced moment - ft. lbs. (various causes)
\( A \) = polar moment of inertia about longitudinal axis - slug ft\(^2\)
\( B \) = moment of inertia about lateral axis thru cg.
\( a = \frac{A}{B} \)

\( \omega \) = spin frequency in rad/sec.

Cause 1 = Misalignment of thrust axis 1/4 degree = .0044 rad.

So \( M = 50,000 \times .0044 \times 12' = 2640 \) ft. lbs.
\( A = 2 \times \frac{10,000}{32.2} \times 1 = 620 \) slug ft\(^2\) to 120 slug ft\(^2\) (at burnout)
\( B = \frac{10,000}{32.2} \times 25^2 = 195,000 \) slug ft\(^2\) to 39000 slug ft\(^2\)
\( a = .0032 \)

\( \omega = 2\pi \times 4 = 25 \) rad/sec using spin-up rockets.

Then \( \phi = \frac{2640}{620 \times 25^2} = .0068 \) rad. = .39\(^\circ\) \(.034 \) rad.

Dispersion angle = .034 \( \frac{8000}{18,000} = .0152 \) rad. = .07\(^\circ\)

Cause 2 = Unbalanced mass distribution; i.e. dynamic imbalance. The empty motor can be balanced to the order of 10\(^{-3}\) rad.

The loaded motor can also be balance to the order of 10\(^{-6}\) rad. This cause of dispersion is thus seen to be several orders of magnitude less that Cause 1 above.

Cause 3 = Tip-off from booster. The attitude of the booster is assumed to be held accurately to .001 rad. * Ejection of Stage 2 and spin-up in 0.5 sec. are expected to increase this value to .002 radian; i.e. 45% of Cause 1.

Conclusion: \( \sqrt{y_1^2 + y_2^2 + y_3^2 + \ldots y_1^2} \) is believed to be of the order of 1 degree for Stage 2.

*Such guidance accuracy may require heavier equipment than assumed in the weight summary.
DISPERSSION OF STAGE 3

Cause 1 - Difference in ignition timing for three (3) rockets. It may be assumed that all 3 rockets ignite, but one of them ignites .005 sec. before the others, thus giving an increment of thrust (say 1/3 of 37,000 lbs) for .004 sec. at moment arm of 3 inches.

\[ M = \frac{\Delta L}{g} = 37,000 \times .005 \times \frac{1}{3} = 30 \text{ ft. lb.} \]

\[ A = \frac{2 \times 1770}{32.2} \times 1.5 = 17.5 \text{ slug ft}^2 \text{ to 8.0 slug ft}^2 \]

\[ B = \frac{1770}{32.2} \times 8^2 = 3500 \text{ slug ft}^2 \text{ to 1700} \]

\[ a = .005 \]

\[ \phi_1 = \frac{30}{25^2} = .0048 \text{ rad.} \]

\[ \gamma_1 = .0048 \times \frac{5200}{25,000} = .0011 \text{ rad.} \]

Cause 2 - 2% difference in thrust of one of three motors

\[ M = .02 \times 37,000 \times \frac{1}{4} = 185 \text{ ft. lb.} \]

\[ \gamma_2 = .0011 \times \frac{185}{30} = .0068 \text{ rad.} \]

Cause 3 - Malalignment of thrust line of one motor 1/4° = .0044 rad.

\[ M = 37,000 \times .0044 \times 6 = 980 \text{ ft. lb.} \]

\[ \gamma_3 = .0011 \times \frac{980}{30} = 0.035 \text{ rad.} = 2° (\text{Probably less}) \]

Conclusion: \[ \varepsilon Y_1 = \sqrt{(Y_1^2)^1 + (Y_1^2)^2 + (Y_1^2)^3} \text{ is believed to be} \]

of the order of 2 to 3 degrees, according to the above analysis. This will vary as \(1/w^2\); hence a slight increase in spin rate would be desirable.
## Weight Summary and Performance Estimate

### Four-Stage Vehicle with IRBM and RTV

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present weight empty of IRBM (Dry)</td>
<td>11,635 lbs</td>
</tr>
<tr>
<td>Residual Propellant</td>
<td>1,897</td>
</tr>
<tr>
<td>Present weight empty of IRBM (Wet)</td>
<td>13,532</td>
</tr>
<tr>
<td>Usable Propellant</td>
<td>97,906</td>
</tr>
<tr>
<td>Gross weight of present IRBM</td>
<td>111,438 lbs</td>
</tr>
<tr>
<td>Items to be removed - Same as p. 7</td>
<td>-5,461</td>
</tr>
<tr>
<td>Items to be added - Same as p. 7</td>
<td>-485</td>
</tr>
<tr>
<td>Net weight of Stage 1</td>
<td>106,462 lbs</td>
</tr>
<tr>
<td>Weight of Stage 2</td>
<td>10,500</td>
</tr>
<tr>
<td><strong>RTV 1st Stage 10,500 lbs (less fins)</strong></td>
<td></td>
</tr>
<tr>
<td>including 6978 lbs propellant</td>
<td></td>
</tr>
<tr>
<td>plus spin-up rockets 150 lbs</td>
<td></td>
</tr>
<tr>
<td>which drop off after .5 sec.</td>
<td></td>
</tr>
<tr>
<td><strong>RTV 2d Stage 1770 lbs.</strong></td>
<td></td>
</tr>
<tr>
<td>including 3 x 263 lbs propellant</td>
<td></td>
</tr>
<tr>
<td>Launch Weight of Stage 1</td>
<td>116,962 lbs</td>
</tr>
<tr>
<td>Less usable propellant in Stage 1</td>
<td>97,906</td>
</tr>
<tr>
<td>Empty weight of Stage 1</td>
<td>19,056 lbs</td>
</tr>
<tr>
<td>Estimated Burnout Velocity of Stage 1</td>
<td>11,800 ft/sec</td>
</tr>
<tr>
<td>Velocity increment Stage 2 = 7250 log 10,350 =</td>
<td></td>
</tr>
<tr>
<td>3,372 - 285 = 7,800</td>
<td></td>
</tr>
<tr>
<td>Velocity increment Stage 3 = 7400 log 1,770 =</td>
<td></td>
</tr>
<tr>
<td>980 - 500 = 4,400</td>
<td></td>
</tr>
<tr>
<td>Velocity increment Stage 4 = 7400 log 500 = 240</td>
<td></td>
</tr>
<tr>
<td>Estimated Burnout Velocity - Stage 4</td>
<td>29,400 ft/sec</td>
</tr>
</tbody>
</table>
METHOD OF COMPUTING PERFORMANCE

The performance of Stage 1 was computed on the 1103 Computer in the same detailed manner as for the IREM. Four values of burnout weight were used; i.e., the nominal weight of the standard missile and three higher values. Burnout velocity and altitude is plotted in Fig. 4 as a function of burnout weight for the case of 97,906 pounds of usable propellant.

For later stages, the velocity increment is shown in Fig. 5 as a function of mass ratio for various values of effective exhaust velocity. The effect of gravity and drag for Stage 2 operation in a long range trajectory was computed on the 1103 Computer, and found to be 285 ft/sec. The velocity increments determined from the chart should therefore be decreased slightly for gravity and drag.

Range as a function of burnout velocity is shown in Fig. 6 for the IREM family of missiles. The four points computed on the 1103 Computer are distinguished by asterisks.
Fig. 4 Burnout velocity and altitude vs weight for stage 1
\[ \Delta V_{st} = V_e \Delta \log \left( \frac{W_0}{W_f} \right) = I_{sp} \Delta \log \left( \frac{W_0}{W_f} \right) \]

- \( V_e \): Effective Exhaust Velocity
- \( W_0 \): Initial Weight
- \( W_f \): Final Weight
- \( I_{sp} \): Specific Impulse

**Figure 5** Stage Velocity vs. Mass Ratio.
APPENDIX I

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

15 May 1957

MEMORANDUM FOR CHAIRMAN, SCIENTIFIC ADVISORY BOARD

SUBJECT: SAB Special Study of Advanced Weapon Technology and Environment

1. Reference is made to your memo of February 20, 1957, transmitting the report of the Fuels and Propulsion Panel, which suggested special studies, on a broad basis, of the problems of national defense in cis-lunar space.

2. In accordance with your suggestion, I would like the SAB to establish such a special study group, to review these problems with particular regard to their impact on future weapon technology and the operating environment in which they may function.

3. The present trend of technology in ballistic vehicle development seems to indicate an early capability of rocket type vehicles to reach new regions of cis-lunar space. This suggests the possibilities of military operations in completely new environments. The attendant technological problems of vehicle design, propulsion, weapons effects, communications, human factors, strategy and tactics, and many others, need careful investigation. The severe impact on military operations makes it imperative that the Air Force keep abreast of the latest thinking in these areas and to be immediately informed of potential breakthroughs.

4. Studies are presently underway at the Ramo-Wooldridge Corporation, in conjunction with WDD and Eg USAF. It is suggested that the SAB committee review the work of these groups (which should be available in August) as well as studies at the RAND Corporation and industry groups which are considering these problems.

5. It is requested that this committee advise the Air Force with regard to the status of present technological knowledge in this field, and the recommended direction of future programs, for both supporting research to explore this new environment and the study of future weapon systems.

(signed)

D. L. PITT
Lt. General, USAF
Deputy Chief of Staff, Development
MEMORANDUM FOR: General B. A. Schriever

SUBJECT: AES (Eastman Kodak)

1. Reference our conversation of 13 May 1957, attached herewith is a second draft of the letter to Dr. Chapman. This is more specific, and is responsive to your discussions on this subject with Dr. Chapman than was the first draft.

2. The FY 59 estimate of 35 million for MB 118L is consistent both with General Pitt's letter of 6 March 1957 and with General Bradley's remarks at the time of the 15 April 1957 briefing to Generals Irvine and Pitt and staffs.

3. The sentence regarding the Eastman Kodak - Lockheed relationship was included in order that Lockheed's role not be compromised.

[Signature]

FOOTNOTE

1 Incl
Draft of ltr.
to Dr. Chapman

CHARLES H. TERHUNE, JR.
Colonel, USAF
Deputy Commander
Weapon Systems
Dr. Albert K. Chapman, President
Eastman Kodak Company
400 Plymouth Avenue, North
Rochester 4, New York

Dear Dr. Chapman,

During my visit to Eastman Kodak on 17 April 1957 we discussed the degree of Air Force support that could be expected for WS 117L during the future. While our exact budget for the fiscal year beginning 1 July 1957 is not yet finalised, I anticipate that the total fiscal year program will be approximately thirty million dollars. Accordingly, Mr. Tuttle's estimate mentioned during our meeting of an annual rate of seven million dollars for the Eastman Kodak portion of the program by early in 1959 appears to me to be reasonable for planning purposes. I am sure you realize, however, that because of your role as a sub-contractor to the prime weapons contractor, the Lockheed Missile Systems Division, specific resolution of your company's support will be a matter for negotiation between Eastman Kodak and Lockheed.

I appreciated your time and hospitality during my recent visit and plan to return in the near future for a comprehensive review of the technical aspects of the work Eastman Kodak is doing on this project.

Sincerely,

B. A. Schraber
Major General, USAF
Commander
GENERAL ORDERS
NUMBER 19)

21 May 1957

I. REVOCATION OF GENERAL ORDERS

1. General Orders Number 15, current series, relating to the redesignation of the Western Development Division, Headquarters ARDC, is revoked.

II. ANNOUNCEMENT OF REDesignATION OF WESTERN DEVELOPMENT DIVISION, HEADQUARTERS ARDC

Effective 1 June 1957, the Western Development Division, Headquarters ARDC with location at Inglewood, California, is redesignated the Air Force Ballistic Missile Division, Headquarters ARDC, without change in station.

BY ORDER OF THE COMMANDER:

OFFICIALS:

W. J. ATKINS
Colonel, USAF
Adjutant

DISTRIBUTION:

A (337)
RDASO (2)
RDSOP (3)
EDBPC (1)

J. W. SESSOMS, JR.
Major General, USAF
Vice Commander
MEMORANDUM FOR COLONEL CHESE, USAF

SUBJECT: Charter - WS 117L Site Selection Board WDD

1. Attached hereto are:
   a. Charter for 117L Site Selection Board.
   b. Request for publication of special orders.
   c. Proposal of preliminary operation of concept for 117L.

2. With regard to items 1a and 1b above, action will not be taken to publish orders establishing the 117L Site Selection Board at this time. In addition to the above, all actions related to site selection such as review of certain documentation procured for your office by WDI shall be an "in-house" exercise. No contacts will be made with major commands, specific bases, etc. until cleared through this office. I have no objection however, to your use of the proposed charter, as terms of reference for the internal "in-house" work performed by your group, and suggest the use of such a document might prove beneficial in the long run when our actions in this area are made public.

3. With respect to your memorandum to the undersigned (reference para 1c above), I seriously doubt that we should suggest to any low ranking group of Eqs USAF personal that the IOC for 117L should be assigned to the Commander, Ballistic Missiles Division, Eqs AEDC. In the first place, these people are not high ranking or influential enough to sell such an idea through action of their board. The net result, therefore, will be that they will raise controversy subject in an uncontrolled manner which will result in more trouble to us in the long run than if we keep it quiet and broach it ourselves at the appropriate time. In other words, let's play down the IOC aspect of the preliminary operational concept and keep our noses to the grindstone on getting the concept out and not jeopardize our chances of getting the IOC by giving it to such a group of low ranking people.

CHARLES H. TISDALL, JR.
COLONEL, USAF
Deputy Commander
Weapon Systems
Dr. Albert K. Chapman  
President, Eastman Kodak Company  
343 State Street  
Rochester, New York

Dear Dr. Chapman:

During my visit to Eastman Kodak on 17 April 1957, we discussed the degree of Air Force support that could be expected for NS 1171 during the future. While our exact budget for the fiscal year beginning 1 July 1957 is not yet finalized, I anticipate that the total fiscal year program will be approximately thirty million dollars. Accordingly, Mr. Tuttle's estimate mentioned during our meeting of an annual rate of seven million dollars for the Eastman Kodak portion of the program by early in 1958 appears to us to be reasonable for planning purposes. I am sure you realize, however, that because of your role as a subcontractor to the prime weapons contractor, the Lockheed Missile System Division, specific resolution of your Company's support will be a matter for negotiation between Eastman Kodak and Lockheed.

I appreciated your time and hospitality during my recent visit and plan to return in the near future for a comprehensive review of the technical aspects of the work Eastman Kodak is doing on this project.

Sincerely,

**SIGNED**

B. A. Schulz
Major General, USAF
Commander

DOWNGRADED: AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10
PERSONNEL ACTIONS MEMORANDUM

28 June 1957

1. VOC, Iss 25 Jun 57, Asg Col Harry L Evans Jr., 4619A, this Div, this sta, Prim Dy as Chief, Bqr & Eqp Ofo, Wpn Sys (8446) FA: 57000, are cfm, ESFWO. WDIN

2. The (3) wth AFSC 8446 of Col Harry L Evans Jr., 4619A, this Div, this sta, is w/d and v/b del.


4. The (add) AFSC 8441 of Col Harry L Evans Jr., 4619A, this Div, this sta, is w/d and v/b del.

5. Col Harry L Evans Jr., 4619A, this Div, this sta, is wth AFSC 8441 desig (add). AUTH: Ltr HEIRDFAF, Subj: Avd of BAD Spec, dtd 7 Jun 54.

6. VOC, Iss 20 Jun 57, Asg Capt David D. Braeden, 17335A, this Div, this sta, Prim Dy as Proj Off, Far & Equip Sec, Far & Test Br, WS-127L; Dir WS-117L Wpn Sys (8446) FA: 57000, are cfm, ESFWO. WDIN

7. VOC, Iss 23 Jun 57, Asg Capt Keith C. Kinsley, 26470A, this Div, this sta, Prim Dy as Proj Off, Mal Dev Div, WS-315A, Wpn Sys (8446) FA: 57000, are cfm, ESFWO. WDIN

8. VOC, Iss 24 Jun 57, Asg Capt Alan G. Fouda, 25526A, this Div, this sta, Prim Dy as Asst Proj Off, (Aero Jet) Prop Div, Wpn Sys (8446) FA: 57000, are cfm, ESFWO. WDIN

BY ORDER OF THE COMMANDER:

JACK E. TICE
Captain, USAF
Ch, Mil Pers Div

OFFICIAL:

JACK E. TICE
Captain, USAF
Ch, Mil Pers Div

DISTRIBUTION:

2-HEARDOC
1-En Off
150-Pers Sys
MEMORANDUM:

SUBJECT: Revision of the WS-117L Program

1. The decision of the United States to launch a small scientific satellite in orbit during the IGY has committed this country to a program of investigating space. Unfortunately, some people have looked on this project as a stunt which will be completed at the conclusion of the IGY. The fact is, however, that a tremendous public and scientific interest has been generated in upper air research and the impetus provided by the scientific satellite will not easily be halted, if at all. It is generally recognized by the scientific community that the first satellite is an initial step only which, even if successful, would obtain only a small part of the basic data needed and desired. An analysis of the advantages which the Department of Defense can obtain from Project Vanguard, if successful, is attached as Incl. 1. The limited number of orbit attempts in the Vanguard Program will not provide the total amount of data required and many valuable experiments cannot be performed because of the payload limitation in the vehicle. It is apparent, therefore, that a requirement will exist to extend and modify the Vanguard Program.

2. The National Academy of Sciences is on record in favor of an extension to the Vanguard Program as evidenced by attempts to obtain authority for launching an additional six satellites. Another investigation concerns using a modified Vanguard vehicle with increased payload. A pertinent point in both of these extensions is that they are proposed under continuing Navy management. It should be realized that the Navy is already inserting in publicity releases that the Navy was selected to manage Project Vanguard "because of demonstrated technical superiority in this area." If the Navy is allowed by default to obtain a continuation of the Vanguard Program, then the Navy has a strong possibility of becoming firmly established as satellite and space "experts" and the role of the Air Force in this area will be seriously jeopardized.

3. In 1955 when the services were asked to make proposals for the scientific satellite program, the Air Force was at a critical period in the ICBM program and the I17-L System was not yet authorized. An additional program of questioned value could not then be allowed to interfere with the ICBM effort. Now however a different situation exists. The ICBM effort is well on the way and the I17-L is an established project. The Air Force should now be in a position to aggressively take steps to insure that any further satellite program is under Air Force management.

4. It is recommended that the Air Force revise the WS-117L test program to provide for a Phase I and II as follows:

   Phase I - Test of Vehicle and Orbit Capability

   Phase II - Capability Test of the Reconnaissance Package
Memo, Subj: Revision of the RS-117L Program, 5 July 57

Weight and space in the satellite during Phase I should be devoted to scientific experiments. A possible method of handling this is to propose a certain number of test vehicles in which the NAS can place instrumentation of a specified weight and volume. If a program is established along these lines, the Air Force will obtain the following advantages:

a. Maximum assurance that space programs will become the role of the Air Force alone.

b. International objections are not likely if the vehicle is for scientific purposes. Thus testing up to the point of putting in the reconnaissance package could be completed prior to any possible objections.

ASA B. GIBBS
Colonel USAF
8 July 1957

Subject: AF 01(647)-97
Status of Contract Funds

To: Chief
Ballistic Missile Office
Air Material Command
Attn: E. S. Silberman
P. O. Box 262
Inglewood, California

Through: Assistant Air Force Plant Representative
Lockheed Aircraft Corporation
Missile Systems Division
Van Nuys, California

1. The Weapon System Contractor wishes to advise the Ballistic Missile Office that the current cost commitments on the subject contract indicate that 85% of current funding will be expended by approximately the first week in August and 100% of current funding will be expended by approximately 15 August 1957.

2. This condition is due to an increase in expenditure rate to meet the schedule as set forth in your Request for Proposal Work Statement and further commitments toward completion of our subcontract structure.

3. You are requested to take whatever action is deemed necessary to obtain additional funds for the period from approximately August 15 to the end of November, 1957, to adequately cover this program until such time as a definitive contract is executed. It is estimated that $7,900,000 will be required to fund this program between August 15 and November 30, 1957.

4. The Contracting Officer's prompt cooperation in amending the subject Letter Contract with the above required funds will be greatly appreciated.

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

/s/ J. C. Wingerd
J. C. Wingerd
Military Relations Representative
WS 117L Project
This Diary is submitted pursuant to the revised organizational arrangements effective 1 Jul 57, providing for establishment of the WS 117L Branch.

This issue of the Diary will serve to continue items previously submitted under the MCPTB Diary.

1. Lockheed Aircraft Corporation - AF 04(647)-97 (UNCL)

   a. One result of a recent visit to the Contractor's plant was concern as to possible economies in special test equipment costs. The Contractor had submitted a request for approval to purchase items of test equipment, some of which may already be available to the Contractor through his subcontracts and other items may not actually be essential to the program. Consequently, a conference has been arranged for 25 July, at which time the Contractor will submit a test equipment plan. It is proposed to review this jointly between the Contractor, EMD, TAM and the ACO. This conference should eliminate any duplications and decide which items can be made available from Subcontractor facilities, and should also result in a considerable saving to the program.

   b. The Contractor has requested an additional increment of funds to carry the contract forward through September 1957. At this writing adequate P600 funds are available; however, the nature of the Contractor's work at this stage reflects a requirement for other types of funds. Steps have been taken to expedite the receipt of such fund allocations through 3C AMC.

   [Signature]

   JAMES S. SEAY
   1/Colonel, USAF
   Chief, WS 117L Branch
Presentation to the Scientific Advisory Board Ad Hoc Committee To Study
Advanced Weapons Technology and Environment. To be presented at the
first meeting of the Committee, 29 July 1957, at the Rand Corporation,
Santa Monica, California.

Good morning,

Mr. Chairman, and Gentlemen: It is with pleasure that I have come to
talk to you today on the contributions of the Ballistic Missiles Program to
the achievement of advanced weapons and space flight. This is because of the
importance of the subject which you are considering. It is important not only
to the Air Force but to the Nation as a whole. I feel that the appointment of
your committee by the Scientific Advisory Board is very timely because of the
increasing and considerable developments that have occurred in the areas of
technology under your consideration. There certainly is ever-increasing
national recognition of and interest in the application of this technology
to future weapons. I had the pleasure of addressing most, if not all, of you
at the Scientific Advisory Board meeting at AFRC on 21 May 1957. At that time,
I discussed several aspects of the future of ballistic missiles including a
certain amount of incorporation on advanced weapons systems. It is in this latter
area that I would like to concentrate my efforts today.

We at AFMD have a natural interest in the opportunities that the develop-
ments of our program offer for more advanced applications. Even though our
primary and preoccupying job is to produce ballistic missiles (to develop an
early deterrent and strike capability), we would not be doing our job properly
if we did not give some attention to the future application and extension of
these developments.

DOWNGRADED AT 12 YEAR
INTERVALS: NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

WITH 57-242
CONFIDENTIAL
It is because of the close affinity of developments of the Ballistic Missile Division to more advanced weapons that we have been given management responsibility for the Advanced Reconnaissance System. This system, Weapon System 117L, will, I understand, be more fully reported on by a representative of Lockheed Aircraft Corporation. Lockheed is participating as a prime weapon system contractor for the Advanced Reconnaissance System. I will, therefore, make my remarks more generally applicable to the particular subject of your committee's concern. Another area, which I do not seek to discuss fully since it will be covered subsequently, will be these study efforts in which we have asked the Rand-Wooldridge Corporation to engage. For this purpose Rand-Wooldridge has formed a special study panel, under Dr. Bacher, to study the requirements for advanced weapon systems versus the capabilities that exist to produce such systems. I believe the foregoing examples are, however, sufficient to indicate to you that we are in fact aware of and are involved in considerations regarding advanced weapons. Back of all of this is, of course, a rather fundamental underlying reason. It is this: Any future ballistic missiles, or any system which seeks to go into "non-aerodynamic" space will require relatively large amounts of energy in the form of a propulsive device, along with an attendant requirement for guidance, auxiliary power, launch facilities, techniques, etc. If we consider payloads in excess of a few pounds, the only significant existing equipment developments which would serve as a basis for meeting these needs are not contained within the ballistic missiles program.

At this juncture, I would like to make a point which is perhaps obvious but which because of its significance need some emphasis. The attainment of these items of hardware (large airframes, propulsion, guidance, etc.) plus the
supporting facilities and techniques required for their development and production is extremely costly in terms of both dollars and manpower. It does not appear likely that the Air Force or the Nation as a whole will be able to afford extensively diversified and perhaps competing development programs toward the goals which you are studying. Another way of looking at it is that the Air Force must develop a coherent program in this area of technology in order that, first of all, our military requirements can be met and, secondarily, that the most efficient use be made of the developments available from present and anticipated programs in this broad area.

I would like now to discuss some of the quantitative aspects of our development work. We have given careful study to the ability of the three ballistic missiles (SM 65, SM 69, SM 75) under development by AFMD to carry loads other than those of the standard warheads for which they have been designed. This (slide 1) shows the results of these analyses insofar as the problem of carrying a satellite vehicle on the ICBM is concerned. You will note that the SM 65 and SM 69 have essentially the same capabilities. This is for the unmodified vehicle less its standard nose cone plus only those fittings necessary to attach the larger payloads to the vehicle. Depending on the actual structural factors obtained with the MS 117L vehicle, it may also be possible to orbit with substantial payloads (50 - 300 lbs.) using an ICBM as a booster. For certain scientific missions this might be the most economical approach.

We have also studied the application of these missiles with some modification.

This (slide 2) shows certain feasible combinations. The first case is the present MS 117L configuration, the second diagram illustrates a modified SM 65 with a cylindrical oxygen tank to permit it to carry a heavier nose cone. The present sustainer engine would be replaced with one of the first stage engines,
making three 150,000 lb. thrust engines in all. Two upper stages are visualized, one is the second stage of the SM 68, and the other is a new design using ammonia and fluorine as propellants. Note the very large payloads that can be carried with these configurations.

The previous discussion pertained to liquid fueled propulsion. Important advances during the last year or so have caused AFMD to take an up-to-date look at the role of solid propellants, particularly as applied to Intermediate Range Ballistic Missiles. As their study was fairly extensive, time permits us only to cover certain of its highlights. Parametric design analysis of the capabilities of ballistic missile systems utilizing solid propellant propulsion systems were studied for the 1960, 1965, and 1970 areas. These analyses included the determination of the performance parameters of missiles capable of delivering warheads weighing from 300 to 10,000 pounds for ranges varying between 500 and 2000 miles.

The results presented (slide 3) indicate that ballistic missile systems based on solid propellant rocket engines have significant growth potential over the time period 1960 to 1970.

For all the parameters which form the basis of these analyses, conservative values consistent with sound engineering practice and practical manufacturing considerations were chosen. For example, the propellant characteristic exhaust velocity, $C_e = 4800$ ft/sec, assumed for the 1960 time period, has already been exceeded in test firings of motors providing up to 75,000 pound seconds of impulse. Similarly, the development of the solid propellant missiles considered for the 1960 time period does not require any radical improvements in the present state-of-the-art.

The advantages of such solid propellant missiles as were considered appear to be quite worth while from the point of view of production cost, relative ease of handling, and requirements for operational facilitics.
In the field of guidance, as you know, we are presently developing both radio inertial and all inertial guidance systems. Because of its relatively light weight and high accuracy, the General Electric radio guidance equipment of the ATLAS booster could be used to track and guide satellite or lunar vehicles during the initial portions of their flight. To obtain the burnout speed required for satellite or lunar applications, the velocity increment which must be added following separation from the booster will be quite large and both cases certain additional guidance equipment would have to be carried in the second stage vehicle. The accuracies required for placing a vehicle on a lunar impact course are well within the capability of present guidance equipment. Establishing a lunar satellite is also within present guidance capability, but if the orbit is to be closely controlled the problem becomes one of sensing errors in the trajectory as the vehicle approaches the moon and applying corrective increments during the final burning period. The most difficult lunar trajectory from the point of view of guidance requirements is circumnavigation of the moon and subsequent recovery at earth. With present accuracy limitations, this mission can be attempted only by swinging wide around the moon so that uncertainties in the distance of closest approach are not great enough to risk impact.

Now let us turn to the problem of auxiliary power aboard the vehicle in question. Because of the relatively short flight times of the ICBM and IRBM the auxiliary power equipment being developed for these missiles would not in its present form be directly applicable to uses requiring much longer duration power such as those aboard a satellite or lunar vehicles.

During the course of the ballistic missile program we have developed a large array of facilities for testing purposes, both of a static and of a
flight test nature. Not only the facilities themselves but the knowledge
gained in their development, construction and utilization will be of consider-
able importance in future programs.

Another area that I would like to touch upon is the technique of
launching of these large vehicles. We have had to face many new problems and
solve them satisfactorily before we could test our presently developed vehicles.
Most of the experience gained here will be a valuable stepping stone toward
future development programs.

Last of all I think it fitting to mention the industrial base that has
been established. By the creation of the Air Force Ballistic Missiles program
a large array of contractors in a wide variety of fields have, because of their
participation, gained extremely valuable experience in the development of
components and testing of the many pieces of hardware that go into this type of
technology. But sometime in the future as we phase out of the primarily
developmental aspects of the ICBM and the ICBN program to those more of an
operational nature, a fairly large industrial base will become available on
which future programs might well be based.
30 July 1957

SUBJECT: Program Planning Guidance for WS 117L

TO: Deputy Chief of Staff, Development
   Headquarters, USAF
   Washington 25, D. C.

1. Deputy Chief of Staff, Development, letter of 10 December 1956, subject "Requirement for Additional FY 1957 Funds for WS 117L," stipulated that neither a mockup for inspection nor a complete experimental test item be constructed "until further advised."

2. "Air Force Ballistic Missile Division is currently in the process of definitizing the Lockheed prime contract for WS 117L.

   This contract is being written for a twenty-two month period beginning July 1, 1957. In order to begin orbital testing in 1960 (DCS/D letter, "Planning and Funding Requirements for WS 117L," dated 6 March 1957), it will be necessary because of the lead times involved, to include in this contract construction of a mockup and ground and non-orbital flight test vehicles. It is requested that authority be granted to initiate timely action on these items compatible with the 1960 orbital flight date.

FOR THE COMMANDER:

SIGNED
CHARLES H. TERRILL, JR
Colonel, USAF
Deputy Commander
Weapon Systems

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY CLASSIFIED; DOD Dir 5200.10
MEMORANDUM FOR COLONEL TERRONE

AUG 1 1957

SUBJECT: First Meeting of the SAB Ad Hoc Committee on Advanced Weapons and Environment, 29-31 July 1957

1. There is nothing of a spectacular nature to report on the open sessions of the meeting. Essentially the same information was presented by the various industrial contractors (e.g., with Germanic accents - Dornberger, Steinhoff, Friedrich, Ericksen) and depending upon whether or not the company had participated in ROMEO BOMI type work they were either pushing for the boost-glide concept or not.

2. Of the various presentations the best in terms of both content and presentation was that of R-W's given by Jack Irving. Rand's also was good as was Lockheed's. Of the rest too many appeared to be either rehashes of old material (Steinhoff representing Aerophysics actually used the old HADC study on the Ballistic Rocket Test Vehicle) or were obviously hasty back-of-the-envelope deals. Two or three were just plain lousy.

3. Ridenour, who with Salter spoke for Lockheed, made quite a pitch for a strong environmental program aboard the WS 117L vehicle. After discussion with Carter about this it appears that Ridenour was trying to put pressure on us to let Lockheed do some of this work. As you know, we have given this job - the environmental job - for WS 117L to AFGRC. AFGRC has at least an order of magnitude more capability and experience than IMSD in this area and I do not see building up IMSD when the Air Force already has the capability at its disposal.

4. A copy of the agenda and list of attendees is attached.

2 Incls
a/s (UNCL)

FRANCIS C. E. ODER
Colonel, USAF
Director, WS 117L

SAB Report dated 9 Oct 57

DECLASSIFIED. DOD IR 5200.10
ARDC PRESENTATION TO THE SAB AD HOC COMMITTEE
ON
ADVANCED WEAPONS TECHNOLOGY AND ENVIRONMENT
29 July 1957

0945-1000 ARDC Keynote Speech
Brig. Gen. Marvin C. Deuker
Dep Cdr, R&D, Hq ARDC

1000-1025 Selected Systems Studies
Col. Augustus Prentiss
Dir of Systems Plans
Dep Cdr, Weapon Sys, Hq ARDC

5 min Discussion

1030-1040 BREAK

1040-1055 Contributions of the AFBMD
Col. Frederick Oder
Dir of System 117-L
Program to Future Weapons
AFBMD

5 min Discussion

1100-1130 Propulsion, Secondary Power,
Mr. Ezra Ketcher
and Vehicle Design
Tech Dir, Dir of Labs, WADC

5 min Discussion

1135-1155 Guidance and Control
Mr. James Burke
Tech Adv, Dir of Air Weapons
Dep Cdr, R&D, Hq ARDC

5 min Discussion

1200-1300 LUNCH

1300-1310 Communications
Major Edward Wright
Comm & Elec Dir
Dep Cdr, R&D, Hq ARDC

5 min Discussion

1315-1335 Human Factors
Brig. Gen. Donald Flickinger
10 min Discussion
Dir of Human Factors
Dep Cdr, R&D, Hq ARDC

1335-1415 Geophysics
Dr. Murray Zakiloff
5 min Discussion
Chf of Photo-Chem Lab
Geophysics Res Dir
AFGRC

1425-1445 Research Trends
Dr. Morton Alperin
5 min Discussion
Dir of Office for Advanced Studies
AFOSR

1450-1515 Summary Discussion of the
ARDC Presentation
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

SAB SPECIAL STUDY OF ADVANCED WEAPONS TECHNOLOGY & ENVIRONMENT
29-31 JULY 1957
THE RAND CORPORATION, SANTA MONICA, CALIFORNIA

TENTATIVE AGENDA

MONDAY - 29 JULY 1957 - ( Entire day closed to Industry representatives )

0900 - Executive Session (Committee members only)
0925 - Introduction - General Pat, DCS/Development, Hq USAF
0930 - Directorate of Development Planning, DCS/Development, Hq USAF

LUNCHEON BRIEFING.

0940 - Keynote Speech - Brig Gen. M.G. Dealers, Deputy Commander, R&D
1000 - Systems Studies - Col A. M. Proutt, Jr., Director, Systems Plans
1030 - AFRSD Studies - Maj. Gen. R. E. Shriver, Commander, AFRSD
1100 - Vehicle Design, Propulsion & Secondary Power
     Mr. Ezra Kotcher, Tech Director for Dev., Directorate of Labs.
1130 - Guidance, Control, Communications - Dr. J. V. Burke, Tech Director,
     Weapons Division
     Major E. N. Wright-Chief,
     Navigation Aids Branch

1200 - Lunch
1300 - Human Factors - Brig Gen D. Fickinger, Command Surgeon, Director
     of Human Factors
1330 - Geophysics - Dr. H. Zelikoff, Cambridge Research Center
1400 - Research Trends - Dr. N. Alperin, Office for Advanced Studies, OSD
1430 - Discussion Period
1515 - Break
1530 - Remo Wooldridge Presentation (G. Remo)

TUESDAY - 30 JULY 1957

0900 - Executive Session
0915 - RAND Presentation (R. Buxheim) (Open to all attendees)
1115 - Break
   Each of the following presentations are closed to industry representatives other than the company making the presentation:
1130 - Aeromatics Systems, Inc. (E. Kramle)
1200 - Lunch
1300 - Aerodynamics Development Corp. (H. Bellery)
1330 - Boeing Aircraft Co. (H. Dornberger)
1400 - Bell Aircraft Co. (H. Dornberger)
1430 - Break
1500 - Convair Astronautics Division (H. Friedrich)
1530 - Douglas Aircraft Company (E. Wheaton)
Tentative Agenda for
SAB Special Study of Adv Wns Technology & Environment (continued)

TUESDAY - 30 Jul 57 (continued)
1600 - Lockheed Missiles Systems Div. (L. Ridgway)
1630 - Martin Company (C. Trimble)
1700 - North American (R. Wilson)
1730 - Adjourn

WEDNESDAY - 31 July 1957

Executive Session (Committee members only)
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

ATTENDEES AT SCIENTIFIC ADVISORY BOARD MEETING ON
ADVANCED WEAPONS TECHNOLOGY AND ENVIRONMENT

19 July 1957

SCIENTIFIC ADVISORY BOARD

STRUM, Dr. B. G. Guyford (Chairman)
KAPLAN, Prof. Joseph
MILLIKAN, Dr. Clark S.
MILLS, Dr. Mark M.
RADFORD, Dr. W. H.
RAMO, Dr. Simon
WHITE, Dr. Clayton S.
(Alternate: Dr. Loren Carlson)
HASKETT, Mr. Chester H.

HQ USAF

DOOHAN, Colonel
CARLSON, Dr. Harold
FENSLER, Mr. Wm. E.
GEYER, Dr. R. Kenneth
GRAY, Dr. James
MISER, Mr. Joseph A.
MCDOWELL, Col. M. L.
MUSSEY, Col. Ralph J.
SHARIATIAN, Maj. Gen. L. S.
TIPTON, Col. James

HQ ARDC

BURKE, Mr. James V.
DEMLER, Brig. Gen. M. C.
FLICKINGER, Brig. Gen. D.
HEATHERINGTON, Dr. Albert
KIESLING, Col. E. H.
MASSEY, Maj. Julius H.
MUS, Lt. Col. O.
PRENTISS, Col. A. M., Jr.
STRATTON, Lt. Col. G. O.
VAH, Lt. Col. J. O.
WILTON, Col. Wm. A.
WRIGHT, Maj. E. H.
CODER, Col. AFMD
REIFEL, Brig. Gen. - AFMD
SCHREIER, Maj. Gen. - AFMD

HQ USAF

- Deputy Dir of Research and Development
- Directorate of Intelligence
- Air Tech. Intelligence Ctr
- Operations Analysis
- Directorate of R and D
- Operations Analysis
- War Planning
- DCS/Development-Special Projects
- Directorate of Development Planning
- Director of Development Planning
- War Planning

ARDC CENTERS

ALPERIN, Dr. Morton - Dir Adv Studies, AFOSR
BRYAN, Maj. Gen. - Commander, WADC
CAMPBELL, Col. - AFOSR
DAVIS, Maj. Gen. L. - Commander, WADC
FOUSE, George - WADC
GASSER, Col. - WADC
GIBSON, Col. - WADC
GREENBERG, Maj. - AFRC
KAPLAN, Carl. - AFOSR
KOTCHER, Ezra - WADC
MENABDE, Maj. - AFRC
WRIGHT, Weldon - WADC
ZELTROFF, Dr. M. - AFRC
GREGORY, Brig. Gen. H. F. - Commander, AFOSR
Attendees at SAE meeting on Adv Weapons Technology and Environment (continued)

AIR UNIVERSITY
ERWIN, Col. W. H. Bruce

NACA
BOGERS, Dr. Alfred

INDUSTRY

AERONUTRONICS
KRAUSE, Mr.
DURAND, Dr. Eric
HAVENS, Dr. Ralph
JOHNSON, Montgomery
KARSH, Herbert (Proj Officer)
MAYER, Horace

AEROPHYSICS
BOLLAY, Dr. William
STEINHOFF, Dr.

BELLSOUTH
DORSEY, Dr. Walter R.
FORREST, Mr. Clarence L.
ISENBURG, Dr. Joel
STRUHL, Mr. DeForest A.
DEGROOSEL, Mr. Roland
DUKES, Mr. Wilfred

BOEING
LONGFELDER, Mr. Harlowe Julius
BLUMENTHAL, Mr. Leroy Vaughn
MURRAY, Mr. Donald

RAMO-WOOLDRIDGE
IRVING, Dr. John

RAND CORPORATION
BUCHANAN, R. W.
CLARKE, G. E.
CARLSON, R. E.
GAZLEY, Cari, Jr.
HEPPNER, E. C.
KELLOG, W. W.
KREIGER, F. J.
LANG, H. A.
LIESKE, H. A.
WILSON, A. C.

Alternates
AUGENSTEIN, B. W.
DOLE, S. H.
PEASLEE, Lt Col J. C.
PINKEL, R.
SMITH, F. T.
VESTINE, E. H.
MEMORANDUM:

SUBJECT: ANTI-SATELLITE MISSILE SYSTEM

1. The whole world now knows that the United States is planning to launch a small scientific satellite during the IGY. Considerable publicity has also been given to statements that Russia intends to launch a satellite during the IGY. Significant is the fact that Russia has offered no objections to the passage of a satellite over communist territory. It is equally significant that the United States has offered no objection to the passage of a satellite over American territory.

2. The Air Force now has a weapon system program, MS-117D, which has as its object the placing of a military satellite in orbit capable of obtaining order of battle information from any point on the globe. It must be assumed that if the United States can develop such a weapon system, Russia can also. I do not know the policy of the United States concerning reconnaissance of the entire country by a foreign satellite, but I assume that this subject must have been considered in the "Open Sky" proposal and in the disarmament proposals now being discussed. Whether the policy is for or against, it seems to me that this country must have the capability in being to knock a foreign satellite out of the sky. Whether this capability will ever be exercised is similar to the atom bomb question.

3. State of the art information indicates that we can develop a satellite capable of producing usable reconnaissance information within five years. It seems reasonable to assume that Russia can also develop a reconnaissance satellite within five years. If we wish to develop a weapon system capable of intercepting and destroying a foreign satellite during this time period, we had better get busy.

DOWNGRADED AT 12 YEAR LIMIT: "SEGREGATED" "CONFIDENTIAL" "CLASSIFIED" "SPECIAL NEEDS" "SOMETHING" "CONFIDENTIAL" "SOMETHING" "CONFIDENTIAL" "SOMETHING" "CONFIDENTIAL" "SOMETHING" "CONFIDENTIAL"

AGB. GIBBS
Colonel, USAF
13 August 1957

SUBJECT: Contract AF 01(647)-97, Status of Contract Funds

TO: Lockheed Aircraft Corporation
Missile Systems Division
ATTN: Mr. J. C. Wingerd
Post Office Box 504
Sunnyvale, California

1. Reference is made to your letter INSD/35372, dated 8 July 1957, concerning the status of funds.

2. The Air Force fund program for Fiscal Year 1958, applicable to WS 1174, has not been established as of this date.

3. Pending determination of program funding, a limited amount will be made available to the contract. The amount being processed is $3,900,000, which is the maximum additional sum available to carry your program through 30 October 1957.

4. It is therefore requested that you adjust your planning, as indicated above.

/s/ Eugene S. Silberman

EUGENE S. SILBERMAN
Contracting Officer

Administrative Contracting Office
WDTR

MCPS E.H.
Mr. Silberman
MS 1112 REAP Review Program Summary

1. Request necessary action be taken to submit to NRO, 64 AB, a copy of
Form 0960 (Review of Direct Reap Review Requirements) correcting the 3-63 report.

2. The reap review schedule reflects the updates and coordinated requirements for reap to be charged against MS 1112.

3. Request the MS 1112 Project Office be provided with an information copy of the action taken by your office.

2 Add.

1. MS Reap Review Program Summary, Sep 64 and 1 Oct 64.

2. RP TR AN 320.1 (1) "Tractors"
   Deviations, Item 1175:
   8 pp 1211, April, Sep.
   TD 5742216

When actions are withdrawn the classification of this correspondence will be downgraded to public.

DOWNGRADED AT 3 YEAR INTERVALS,
DECLASSIFIED AFTER 12 YEARS,
DOD Directive 5200.1Q
MEMORANDUM FOR COLONEL THERUNE

SUBJECT: Limitation on P-600 Expenditures

1. On Friday afternoon, 9 August 1957, this office received word from the Comptroller of a meeting in Baltimore on 12 August on the above subject. Our assistance was requested and Major Carter attended the meeting.

2. The meeting was called because of verbal instructions received by Baltimore from Mr. Garlock's office in the Pentagon. Baltimore has been given instructions to come up with a plan for very strict control of expenditure of the P-600 monies for FY 58 and all preceding years. Similar instructions have gone via TNX to AMC on other series monies. It is understood that this control on expenditures is necessary to assure that the Treasury does not exceed the national debt ceiling.

3. ARDC has been given an expenditure-ceiling for FY 58 of 633.0 million dollars. During the first six months, expenditures must be held to 316.5 million dollars. As noted previously, this includes all year monies. Hq ARDC has investigated expenditures to date and it appears that approximately 20 million dollars must be cut from the expenditures of the first six months in order to live within the ceiling established.

4. Although the wires from Hq USAF to AMC on the P-100 and P-200 money specifically exempted the ballistic missile program, planning at Hq ARDC was that AFEMD would have to stand its proportionate share of the cut in P-600 money. This matter and the matter of center support of our program was discussed with Colonel Hoeman and Lt Colonel Arnold of Hq ARDC by Major Carter and Major Palmos of AFEMD. As a result, it was agreed that the ballistic missile program would be exempt in the P-600 area also and that the Centers would be instructed that their support activities in support of our program would be exempt from any cut.

5. As a result of Monday's meeting, Hq ARDC will send a wire to each of the Centers with an expenditure ceiling for the first six months of FY 58. This ceiling will be established considering the priority of the programs being conducted at the Center, the relationship between the Centers (test support) and will be calculated to reduce services to...
other agencies of the government which are now furnished by ARDC. We
will receive a copy of this wire and the ceiling for AFEMD will be the
figure we require for the program. Major Palmos gave figures of 24.2
million for the ballistic missiles program, 5.635 million for WS-117L
and .365 million for Cooke AFS and miscellaneous. A statement will
be made in the wires to the Centers which requires the Centers not to
cut any support activity in support of our program. On Friday, 16
August, the Centers are to return to Eq ARDC with a plan as to how they
will live within this ceiling. Certain adjustments will undoubtedly
be made at this meeting to arrive at a firm ceiling figure for each
Center.

6. Although the ballistic missiles program is exempt from the
imposition of a special ceiling, it is understood that WS-117L is not
exempt. Therefore, it is possible that WS-117L will receive a cut
in their P-600 monies.

7. It appears that no further action is required at the moment.
However, we will probably have to scrutinize the final Center support
budget quite closely in order to assure that items we do not need have
not been moved into the "Support of AFEMD" category.

cc: Maj Palmos

LAWRENCE D. ELY
Colonel, USAF
Director, Technical Divisions
NCC, 3d MC, 11 Jul 57, Subj: Establishment of ARDC-AMC Weapon System Project Office for the Advanced Reconnaissance System

WDER

1st Ind

Air Force Ballistic Missile Division, P.O. Box 262, Inglewood, California 16 AUG 1957

TO: Commander, Air Material Command, Wright-Patterson Air Force Base, Ohio

1. Reference paragraph 1, basic letter, the DCS/D directive referred to used the term "conventional" preceding "Weapons System Project Office" from which it is inferred that the AMC-ARDC relationship regarding WS 117L will administratively be more similar to those Weapon System Project Offices at Wright-Patterson Air Force Base insofar as programming and other functions are concerned. These functions can, no doubt, be undertaken by the Ballistic Missile Office.

2. Reference paragraph 2, basic letter, action has already been taken by General Funk to provide personnel to the WS 117L Project Office.

FOR THE COMMANDER

cc: General Funk

J. L. HAMILTON
Colonel, USAF
Executive Officer

Col. Cdr 1171-72
SUBJECT: P-600 Expenditure Ceilings FY 58

THRU: Assistant AF Plant Representative
      Lockheed Aircraft Corporation
      Missile Systems Division
      Sunnyvale, California

TO: Lockheed Aircraft Corporation
    Missile Systems Division
    Attn: Mr. Joe Wingerd
    P.O. Box 504
    Sunnyvale, California

1. As a result of expenditure ceilings imposed during FY 58
   on the Advanced Reconnaissance (ILR) System, Lockheed-Missiles
   Division is hereby requested to reduce invoice billings for payment
   in order that Air Force expenditures on Contract AP01A(67)–77 will
   not exceed $6.6 million dollars of P-600 type funds during fiscal year
   1958. Furthermore, no more than fifty percent of this ceiling is to
   be expended during the first six months of the fiscal year.

2. Lockheed Missile Systems Division is advised that cumula-
   tive expenditures to date for FY 58 approximate $1.0 million dollars.
   It is also to be recognized that a definitization of letter contract AP01A
   (67)–77 is anticipated during the first half of FY 58, which will further
   result in payment of accrued fee and costs. These factors should be
   taken into consideration in developing expenditure rates which will
   comply with imposed ceilings.

3. The contractor is requested to advise the Weapon System
   Project Office as to the effect of these expenditure ceilings in the pro-
   gram as set forth in Work Statement WSDR 57–131.

/s/ Eugene S. Silberman

EUGENE S. SILBERMAN
Contracting Officer
SECRET FROM WDG 8-13-6 FOR AFDC-SP  COLONEL HUZIATI

REFERENCE: TELEPHONE CONVERSATION BETWEEN GENERAL RITLAND CSA
AFMD CM AND COLONEL HUZIATI CSA AFDC-SP CSA ON 27 AUG 57 PD

FOLLOWING ARE FUND ESTIMATES FOR SYSTEM 1171 FOR FISCAL YEARS
1962-1965 PD LIMITED OPERATIONAL CAPABILITY CM BASED ON RATE OF
SIX LAUNCHINGS IN FY 1962 CM AND TWELVE PER YEAR IN FY 1963 CM
1964 AND 1965 CM FIFTY FOUR MILLIONS PER YEAR PD THE ABOVE ARE
COSTS OF A LIMITED OPERATIONAL PROGRAM TO ATTAIN BY 1965 THE
CAPABILITY TO OBTAIN COMPLETE SMALL SCALE COVERAGE PERIODICALLY
AND DEPICTED LARGE SCALE COVERAGE OF SELECTED TARGET AREAS ON A
DAILY BASIS PD

DOWNGRADED AT 12 YEAR
INTERVALS AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

CAPTAIN BRADBURY
1171-72

O.1 RITLAND
Brig. Gen., USAF
Vice Commander
SUBJECT: (Unclassified) Program Planning Guidance for WS 117L

TO: Commander
Air Research and Development Command
Post Office Box 1395
Baltimore 3, Maryland


2. Your request that authority be granted to construct a mock-up and ground and non-orbital flight test vehicles for WS 117L is approved to the extent dictated by sound engineering requirements within minimum essential funds expenditures.

3. In letter from this headquarters dated 6 March 1957, subject: Planning and Funding Requirements for WS 117L, you were advised that the estimate under consideration for FY 1958 were as follows:

   P-100  15.0
   P-200  10.0
   P-600  10.0

   To date only the $10,000,000 of P-600 funds has been approved. Efforts will continue to obtain the desired P-100 and P-200 funds for WS 117L within this fiscal year.

4. All activity on WS 117L must be limited to the ten million of FY 58 P-600 funds presently available.

/s/ D. L. Putt
D. L. PUTT
Lieutenant General, USAF
Deputy Chief of Staff, Development

DOWNGRADED AT 12 YEAR INTERVALS; NO AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

CONFIDENTIAL
SUBJECT: WS 117L Funding FY 58 and FY 59

TO: Director of Research and Development
ATTN: AFDED-SS - Major Francis Dillon
HQ. USAF
Washington 25, D. C.

1. Reference TMX AFDED-SS 42256.

2. The fund requirements and justification for the FY 58 desired budget are contained in WS 117L - MR #4 dated 7 March 1957, a copy of which is in your possession. The only change from MR #4 is the deletion of FY 58 P-300 requirements.

3. Summary forms for FY 58 Austeres Budget, FY 59 Austeres Budget and FY 59 Desired Budget by Subsystem and Budget Program are enclosed. Also enclosed is a copy of Summary Justification for the FY 58 and FY 59 austeres budget submitted to MCPE, 12 September 1957, for AMC use in replying to a request from DCS/H.

4. Justification for the FY 59 desired budget by subsystem is essentially the same as for the FY 59 austeres budget with the main differences as follows:

   a. The major difference in totals required in the P-100 and P-200 area are occasioned by the difference in the number of SM-65 missiles and supporting equipment to be procured under the two budgets. The impact of the austeres budgets for FY 58 and FY 59 is a substantial delay in the initiation of the flight test program. The ground test program in subsystem areas will be increased somewhat to achieve a greater reliability of system components during the stretch out time interval leading to flight test.

   b. It is to be noted that there is a difference in P-600 requirements for the two FY 59 budgets. This is occasioned by

DOWNGRADED - AT 12 YEAR INTERVALS; NO AUTOMATICALLY DECLASSIFIED DOD DIR 5200.10

CONFIDENTIAL
reduction of effort to be placed on the research and development of an advanced version of WS 117L in the austeres program.

5. It is strongly recommended that funding at the rate of the desired budget be furnished for the balance of FY 58. It is estimated that a pro rata amount of the desired FY 58 budget or approximately forty-eight million dollars, would allow initiation of the flight test program by the middle of calendar year 1959.

SIGNED

O. J. RITLAND
Brig. Gen., USAF
Vice Commander

4 Inc Is:
A. FY 58 Fin Plan
   Summary-1 pg (S)
   WDTR 57-337
B. FY 59 Fin Plan
   Summary-1 pg (S)
   WDTR 57-337
C. FY 59 Fin Plan
   Summary Desired
   Budget-1 pg (S)
   WDTR 57-337
D. Cy TX1-MCPTA-91-E
   (S) 7 pgs-WD 57-03980

Maj. Zelenka

CONFIDENTIAL

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* It is to be noted that the above does not include FY 59 P-300 requirements.
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*It is to be noted that the above does not include FY 59 P-300 requirements.*
AFBMD-ARDC/AMC BALISTIC MISSILES OFFICE
INGLEWOOD, CALIFORNIA

COMDR, AMC
WRIGHT-PATTERSON AFB, OHIO

SECRET FROM MCP1A 9-1-E FOR MR FRED TOCKE, MCPZ

FOLLOWING INFORMATION SUBMITTED IN RESPONSE TO TELEPHONE REQUEST
FROM MR FRED TOCKE PAREN MCPZ PAREN TO CAPTAIN LEONARD STASZAK PAREN
MCP1A PD PARA REVIEW OF WM 57-3 DATED 8 AUGUST 57 DOES NOT REVEAL A
CONTINUATION OF THE SCHEDULE BEYOND THREE STARTS UNDER FY 57 FUNDING
PD RECOMMEND THE FOLLOWING CHANGES & ADDITIONS TO THE USAF GUIDED
MISSILE PRODUCTION SCHEDULE PD READING LEFT TO RIGHT COMMA FIRST LINE
COMM ARS COMM LOCKHEED COMM PALO ALTO COMMA BELL XLR-81 COMM ENTER UNDER
CY 1958 JUNE COMM ONE COMM TOTAL SIX MONTHS COMM ONE COMM AUGUST COMM
ONE COMM SEPTEMBER COMM ONE COMM TOTAL SIX MONTHS COMM TWO COMM UNDER CY
1959 JULY COMM ONE COMM OCTOBER COMM ONE COMM DECEMBER COMM ONE COMM
TOTAL SIX MONTHS COMM THREE COMM UNDER CY 1960 COMM FEBRUARY COMM ONE COMM
APRIL COMM ONE COMM JUNE COMM ONE COMM TOTAL SIX MONTHS COMM THREE COMM
TOTAL INCCLUDING ACCEPTANCES COMM NINE COMM FUNDING FY 57 COMM THREE COMM
FY 58 ZERO COMM FY 59 COMM SIX COMM FY 60 FIVE PD NEW ENTRY UNDER

MCP1A

JAMES S. SEAT, LT COL, USAF
Chief, W3 117L Branch
Deputy Director/Ballistic Missiles
Directorate/Procurement & Production

57 MCP 3871
WD-57-03980
ADVANCED RECONNAISSANCE SATELLITE SECOND LINE CRM READ FROM LEFT TO RIGHT
CRM XSM 65 CRM CONVAIR CRM MONTGOMERY FIELD CRM NAA SLASH LEE CRM UNDER
APRIL 60 ENTER ONE CRM FUNDING FY 59 THREE CRM FY 60 CRM FIVE PD
PARA THE FOLLOWING FUND REQUIREMENTS FOR FY 58 AND FY 59 ARE SUBMITTED
FOR A PROGRAM BASED ON AUSTERE FUNDING AND DO NOT REFLECT REQUIREMENTS
NECESSARY TO MEET GOR REQUIREMENTS PD PARA FY 58 FINANCIAL PLAN
SUMMARY AUSTERE BUDGET PAREN A PAREN UNDER THE AUSTERE BUDGET FOR
FY 58 CRM NO PROCUREMENTS CAN BE INITIATED ON SM 65 BOOSTERS PD
PAREN B PAREN AIRFRAME SUBSYSTEM CRM P-1755 PD FOUR MILLION DOLLARS
P-100 FUNDS WILL BE EXPENDED ON CONTINUED FABRICATION OF THREE
SATELLITE NOSE CONES CRM THREE TO BE USED IN THE GROUND TEST PROGRAM
PD PAREN INCLUDES TOOLING AND IN PLANT HANDLING EQUIPMENT PAREN ONE
MILLION DOLLARS P-200 FUNDS WILL BE EXPENDED ON GROUND EQUIPMENT
FOR HANDLING AND CHECKOUT OF THE ASSEMBLED VEHICLE AND ITS EQUIPMENT
PD LOCKHEED AIRCRAFT CORPORATION CONTRACTOR PD PAREN C PAREN PROPULSION
SUBSYSTEM CRM P-1756 PD FOUR MILLION FIVE HUNDRED THOUSAND DOLLARS
P-400 FUNDS WILL BE EXPENDED FOR BELL AIRCRAFT XLR-51 HUSTLER
ENGINES AND ASSOCIATED GROUND TEST PROGRAM PD ONE MILLION DOLLARS
P-200 FUNDS ARE REQUIRED FOR GROUND EQUIPMENT FOR CALIBRATION CRM
CHECKOUT AND ALIGNMENT OF THE PROPULSION SYSTEM PD LOCKHEED AIRCRAFT
CORPORATION CONTRACT DASH BELL AIRCRAFT SUBCONTRACTOR PD PAREN D PAREN
AUXILIARY POWER SUBSYSTEM CRM P-1757 PD SIX HUNDRED THOUSAND DOLLARS
P-100 FUNDS REQUIRED FOR BATTERY ENERGIZED TEST VEHICLE POWER UNITS
FOR GROUND TEST PD FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS REQUIRED
FOR OPTICAL AND ELECTRONIC DEVICES FOR SOLAR ENERGY EQUIPMENT CM
TURBINES AND ALTERNATORS PD LOCKHEED AIRCRAFT CORPORATION CONTRACTOR
PD PAREN E PAREN GUIDANCE AND CONTROL SUBSYSTEM CM CM P-1758 PD TWO
MILLION TWO HUNDRED FIFTY THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR
INITIAL PROCUREMENT ASCENT GUIDANCE UNITS CM TRANSITION COMPUTERS
CM ORBITAL BOOST GUIDANCE UNITS AND AUTOPILOT EQUIPMENT PD FOUR
HUNDRED THOUSAND DOLLARS P-200 FUNDS REQUIRED FOR GROUND EQUIPMENT
FOR CALIBRATION CM ALIGNMENT CM AND CHECKOUT OF GUIDANCE SYSTEM
CM AND EQUIPMENT FOR MONITORING OPERATION OF GUIDANCE UNIT PD
LOCKHEED AIRCRAFT CORPORATION CONTRACTOR PD PAREN F PAREN VISUAL
SUBSYSTEM CM P-1759 PD EIGHT HUNDRED THOUSAND DOLLARS P-100 FUNDS
REQUIRED FOR TEST MODELS FOR LABORATORY CM ENVIRONMENTAL AND
COMPATIBILITY TESTS PD FOUR HUNDRED THOUSAND DOLLARS P-200 FUNDS
REQUIRED FOR SPECIALIZED GROUND PHOTO PROCESSING EQUIPMENT AND TEST
EQUIPMENTS PD LOCKHEED AIRCRAFT CORPORATION CONTRACTOR CM EASTMAN
KODAK SUBCONTRACTOR PD PAREN G PAREN FERRIS SUBSYSTEM CM P-1760 PD
ZERO DOLLARS P-100 FUNDS PD TWO HUNDRED THOUSAND DOLLARS P-200 FUNDS
REQUIRED FOR GROUND ELECTRONIC EQUIPMENT REQUIRED FOR TESTS OF
LABORATORY MODELS PD LOCKHEED AIRCRAFT CORPORATION CONTRACTOR CM
AIRBORNE INSTRUMENTS LABORATORIES SUBCONTRACTOR PD PAREN H PAREN
INFRARED RECONNAISSANCE SUBSYSTEM CM P-1761 PD TWO HUNDRED THOUSAND
DOLLARS P-200 FUNDS REQUIRED FOR INFRARED DETECTOR LINE ELEMENTS AND
MOSAICS CM OPTICAL CORRECTION DEVICES AND FILTERS CM CLOSED LOOP
COOLING SYSTEMS AND ELECTRONIC COMPONENTS PD LOCKHEED AIRCRAFT

57HC4 3871

WD-57-03980
CORPORATION CONTRACTOR FD PAREM I PAREM GROUND SPACE COMMUNICATIONS
SUBSYSTEM CMN P-1762 FD TWO MILLION DOLLARS P-100 FUNDS REQUIRED FOR
AIRBORNE COMMUNICATIONS EQUIPMENT CMN I.E. CMN DATA TRANSMITTER CMN
COMMAND RECEIVER CMN PROGRAMMING TIME GENERATOR CMN ATTITUDE
REFERENCE ENCODER CMN AND ANTENNAS FD FIVE MILLION THREE HUNDRED
THOUSAND DOLLARS P-200 FUNDS REQUIRED FOR PROCUREMENT OF TRACKING
CMN ACQUISITION CMN COMMAND CONTROL CMN TEST AND ELECTRONIC CHECKOUT
EQUIPMENT FOR THREE TRACKING CMN DETECTION AND ACQUISITION STATIONS
FD LOCKHEED AIRCRAFT CORPORATION CMN CONTRACTOR CMN PHILCO CORPORATION
SUBCONTRACTOR FD PAREM J PAREM DATA PROCESSING AND INTELLIGENCE
DISSEMINATION SUBSYSTEM CMN R-1763 FD ONE MILLION DOLLARS REQUIRED
FOR INITIAL PROCUREMENTS OF VIDEO SIGNAL RECEIVERS CMN AMPEX
RECORDERS CMN GEOGRAPHIC REFERENCE EQUIPMENT CMN MINICARD EQUIPMENT
CMN PROJECTION CMN IDENTIFICATION CMN AND CORRELATION EQUIPMENT CMN
DECODERS CMN TIME, SPACE INDEX EQUIPMENT CMN TRACK PLOT PRESENTATION
EQUIPMENT FD NO PRINCIPAL CONTRACTOR SELECTED FD PAREM K PAREM
OEOPHYSICS SUPPORTING PROJECT CMN 1-1764 FD EIGHT HUNDRED FIFTY
THOUSAND DOLLARS REQUIRED FOR THE PROCUREMENT OF AEROSPACE HIGH
ROCKETS TO CONDUCT THE TEST PROBE PROGRAM IN THE GATHERING OF DATA
CONCERNING METEOR IMPACT CMN SOLAR RADIATION CMN ATMOSPHERIC DENSITY
CMN AND THERMAL RADIATION FD NO PRINCIPAL CONTRACTOR FD PAREM L PAREM
SUMMARY COST TOTALS FY 58 FIFTEEN MILLION DOLLARS P-100 FUNDS CMN
TEN MILLION DOLLARS P-200 FUNDS FD PARA FY 59 FINANCIAL PLAN SUMMARY
AUSTERE BUDGET FD PAREM A PAREM FOUR MILLION EIGHT HUNDRED TEN
THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR PROCUREMENT OF THREE SM
65 BOOSTERS FD ONE MILLION FOUR HUNDRED SEVENTY THOUSAND DOLLARS
REQUIRED FOR PROCUREMENT OF GROUND SUPPORT EQUIPMENT FOR SM 65
BOOSTERS FD CONVAIR AIRCRAFT CONTRACTOR FD PAREN B PAREN-AIRFRAME
SUBSYSTEM CMR P-1755 FD SEVEN MILLION TWO HUNDRED THOUSAND DOLLARS
REQUIRED FOR PROCUREMENT OF SIX SATELLITE NOSE CONES AND CONTINUED
GROUND TESTING PROGRAM CMR AND EXPENDITURES INCIDENT TO PREPARATION
FOR INITIATION OF FLIGHT TEST PROGRAM FD TWO MILLION DOLLARS
P-200 FUNDS REQUIRED FOR CONTINUED PROCUREMENTS OF GROUND SUPPORT
EQUIPMENT FD LOCKHEED AIRCRAFT CORPORATION CONTRACTOR FD PAREN C PAREN
PROPULSION SUBSYSTEM CMR P-1756 FD FIVE MILLION TWO HUNDRED TWENTY
THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR PROCUREMENT OF XLR-61
INSTRUMENTS AND CONTINUED GROUND TEST PROGRAM AND EXPENDITURES INCIDENT
TO INITIATION OF FLIGHT TEST PROGRAM FD ONE MILLION THREE HUNDRED THOUSAND
DOLLARS P-200 FUNDS REQUIRED FOR CONTINUED PROCUREMENT OF GROUND SUPPORT
EQUIPMENT INCLUDING DECAY COMPARATORS CMR ELECTRO MECHANICAL PROGRAMMERS
CMR OVER RIDE CONTROLS CMR JET POSITION MONITORS, ETC. FD
LOCKHEED AIRCRAFT CORPORATION CONTRACTOR CMR BELL AGPT SUBCONTRACTOR FD
PAREN D PAREN AUXILIARY POWER SUBSYSTEM CMR P-1757 FD ONE MILLION
ONE HUNDRED FIFTY THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR THE INVERTERS ETC.
PROCUREMENT OF BATTERY POWER SUPPLIES CMR REGULATORS CMR.
ONE MILLION THREE HUNDRED THOUSAND DOLLARS P-200 FUNDS REQUIRED FOR
GROUND SUPPORT EQUIPMENT FOR CONTINUATION OF SYSTEM INTEGRATION GROUND
TESTS AND PREPARATION FOR INITIATION OF FLIGHT TEST PROGRAM FD
CONFIDENTIAL

LOCKHEED AIRCRAFT CORPORATION CONTRACTOR FD PARENT E PARENT GUIDANCE AND CONTROL SUBSYSTEM GM P-1758 FD TWO MILLION FIVE HUNDRED THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR CONTINUED PROCUREMENT OF GUIDANCE EQUIPMENT IN CONTINUOUS SUPPORT OF GROUND TEST PROGRAM AND FOR INITIATION OF FLIGHT TEST PROGRAM FD FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS REQUIRED FOR GROUND SUPPORT EQUIPMENT IN SUPPORT OF GROUND TEST PROGRAM AND INITIATION OF FLIGHT TEST PROGRAM FD PARENT F PARENT VISUAL SUBSYSTEM GM P-1759 FD ONE MILLION FIVE HUNDRED THOUSAND DOLLARS P-100 FUNDS REQUIRED FOR PROCUREMENT OF EQUIPMENT FOR BALLOON TEST PROGRAM AND AIRCRAFT TEST PROGRAM FD FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS REQUIRED FOR CONTINUED PROCUREMENT OF PHOTO PROCESSING EQUIPMENTS GM TEST GM CALIBRATION OF CHECKOUT EQUIPMENTS FD PARENT G PARENT FERRET SUBSYSTEM GM P-1760 FD THREE HUNDRED FIFTY THOUSAND DOLLARS P-100 FUNDS ARE REQUIRED FOR PROCUREMENT OF COMPONENTS OF AIRBORNE FERRET EQUIPMENT FOR SYSTEMS INTEGRATION AND GROUND TEST FD FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS ARE REQUIRED FOR PROCUREMENT OF GROUND TEST GM CALIBRATION AND CHECKOUT EQUIPMENT FD PARENT H PARENT INFRARED RECONNAISSANCE SUBSYSTEM GM P-1761, FD FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS ARE REQUIRED TO PRODUCE CALIBRATION GM CHECKOUT GM AND DATA REDUCTION AND ANALYSIS EQUIPMENT FOR USE IN CONJUNCTION WITH HIGH ALTITUDE MEASUREMENTS FROM BALLOONS AND AIRCRAFT OF JET AND ROCKET EXHAUSTS AND OF EARTH BACKGROUND FD LOCKHEED AIRCRAFT CORPORATION GM CONTRACTOR FD

57 MOP 3871

CONFIDENTIAL

ND-57-03980
PAREN I PAREN GROUND SPACE COMMUNICATIONS CMR P-1762 FD THREE MILLION
DOLLARS P-100 FUNDS ARE REQUIRED FOR PROCUREMENT OF AIRBORNE COMM-
UNICATIONS EQUIPMENT FOR FLIGHT TEST VEHICLES INCLUDING DATA TRANS-
MITTERS CMR COMMAND RECEIVERS CMR ENCODERS CMR AND ANTENNAS FD FIVE
MILLION SIX HUNDRED THIRTY THOUSAND DOLLARS P-200 FUNDS ARE REQUIRED
FOR PROCUREMENT OF GROUND COMMUNICATION CMR ACQUISITION CMR CONTROL
CMR TRACKING CMR AND CHECKOUT EQUIPMENT FOR THE FLIGHT TEST PROGRAM
FD PAREN J PAREN DATA PROCESSING SUBSYSTEM CMR P-1763 FD FOUR
MILLION FIVE HUNDRED THOUSAND DOLLARS P-200 FUNDS ARE REQUIRED FOR
PROCUREMENT OF VIDEO SIGNAL RECEIVERS CMR RECORDING EQUIPMENT CMR
GEOGRAPHIC REFERENCE EQUIPMENT CMR MINICARD EQUIPMENT CMR ELECTRONIC
ORDER OF BATTLE EQUIPMENT CMR AND COMMAND PROJECTION EQUIPMENT FD
PAREN K PAREN GEOPHYSICS CMR SUPPORTING PROJECT CMR P-1764 FD FOUR
HUNDRED SEVENTY THOUSAND DOLLARS P-100 FUNDS ARE REQUIRED FOR
PROCUREMENT OF AIRBORNE ELECTRONIC EQUIPMENT FOR USE IN HIGH
ALTITUDE ROCKET SOUNDINGS FD FIFTY THOUSAND DOLLARS P-200 FUNDS ARE
REQUIRED FOR PROCUREMENT OF LAUNCHING EQUIPMENT FOR USE WITH MIKE-
CAJUN LAUNCHINGS TO INVESTIGATE MICROMETEORITE PHENOMENA IN THE FAR
NORTH FD NO PRINCIPAL CONTRACTOR FD PAREN L PAREN FUND TOTALS CMR
FY 59 CMR P-100 CMR TWENTY SIX MILLION TWO HUNDRED THOUSAND DOLLARS
CMR P-200 CMR EIGHTEEN MILLION TWO HUNDRED FIFTY THOUSAND DOLLARS FD
MEMORANDUM TO GENERAL FORD

SUBJECT: Possible Items for Discussion at Lockheed Missile Systems Division

7 October 1957

1. In line with your proposed visit to MSRD, submitted below are several items which will probably arise as a result of your discussion with Mr. Carter:

   a. Definitization of Letter Contract AF 04(647)-97:

      Letter Contract AF 04(647)-97, issued in October 1956, cannot be definitized until a release has been made on the FY 58 program. The contractor has, however, submitted a proposal based upon a definitive work statement forwarded to the contractor by the WERO in May. The proposal was for the period October 1956 to May 1959 at a cost of $106,000,000. This included a proposed fee of 10%. MSRD is extremely desirous to definitize the letter contract no later than 31 December in order that the work can be shown in the contractor's 1957 financial statement. In this regard, if negotiations commence in early November, there is a possibility that the formal definitive document can be distributed in late December. However, January or February appears to be more realistic. The performance of this contract would be up to, but not including the first firing, which is scheduled in May of FY 59. The contractor has stated that the proposed flight schedule cannot be accomplished since authorization to proceed with a manpower build-up was not authorized on 1 July 1957. Authorization could not be granted due to the lack of a firm program. The WERO is in the process of reviewing the contractor's proposal to ascertain if costs and manpower projections are realistic even though the proposal will have to be modified once the FY 58 program is determined. It is believed that the contractor's course of action will be to slip the schedule by the number of months necessary to make the current proposal compatible with the FY 58 funds authorized. In reviewing the current proposal, this office has requested the contractor's task sheets and related manpower figures. Mr. Carter has objected to furnishing this information as it is his position that since the information must be changed, the WERO will be analyzing non-factual cost data. This office does not endorse Mr. Carter's opinion as the amount of effort required will remain about the same. The only change will be the timing.

   b. Contract Fund Status and Expenditure Ceiling:

      The contract reflects a face value amount of 15.1 million dollars, of which 12.8 million dollars are P-600 funds. An expenditure ceiling has been imposed upon MSRD in the P-600 area in the amount of 9.6 million dollars. It is further provided that only 4.8 million dollars can be invoiced during the first half of the fiscal year. AMC has imposed a 5% reduction of anticipated billings on the balance (2.6 million dollars P-100 funds). As a result of these expenditure ceilings, and the small amount of funds on contract, the contractor advised by letter dated
MEMORANDUM TO GENERAL FUND (Cont’d)

SUBJECT: Possible Items for Discussion at DMD

7 October 1957

30 September 1957, that 85% of present contract funds will be reached by 1 November 1957. The WMD anticipates that additional funds can be provided by 1 November if formal release on the W-23 program is given by 15 October 1957. Additional funds will also provide relief to the contractor on expenditures with respect to P-100 type funds.

c. DMED Test Plan:

The contractor was advised by letter dated 23 September 1957, copy attached, that the DMED test plan was unacceptable. The main objection was in the fact that DMED proposed to do a significant portion of in-house testing and manufacturing for items which probably could be subcontracted. In order to do in-house testing, the contractor's test plan requested Government facilities in the amount of approximately $3,000,000. The contractor had been advised on numerous occasions that no Government facilities were available for the WS 117L program. The Contractor Selection Board selected Lockheed based on the fact that Government facilities would not be furnished. The facilities clause of the contract also states that no Government facilities will be furnished other than items available in the industrial reserve.

1 Enc
Cy of letter to DMED dtd 23 Sep 57 (UNCL)

JAMES S. SEAY
Lt Colonel, USAF
Chief, WS 117L Branch
Deputy Director/ Ballistic Missiles
Directorate/Procurement & Production

57MCP-4295
SEP 23-1957

2. Port Plan and Port Philosophy

The comments that follow are derived from something more than the Port plan and philosophy. They involve the system concepts that have been developed, the Port concepts, and the design concepts that have been developed. This material is based primarily on these concepts and develops the relationships that exist between these concepts. All is considered part of a National system development program and will further describe the development and the current status of these developments. Initially, the basic development will be implemented by the system and will be utilized in the development and test of the 300,000 system.
office policy, continued systems, issues, etc. That is benign for}-


(1) "A vigorous and healthy equipment industry is

(2) "A proper industrial base in the equipment in-

(3) "Only reasonable prices and costs are allowed",

(4) "Government-recognized standards are used by the

(5) "Implementation of development in funded"

6. The complex nature of US 12175 and the uneven demands for relatively improved by the operational concept and equipment to establish a requirement for a carefully planned and executed tech-

Further, the scope of US 12175 has developed the system in proportion every field of technology some of which will benefit to the combat effectiveness of the system. The Air Force has been planning the development of the Tactical Aircraft Components program in each of these fields of technological significance. The Air Force philosophy expressed in the preceding paragraphs is basically expande
NOTE
Col. Riepe 1175
NFA 03

PP INCL 7466
DE RJWPNF 31F
P 0818152
FM HED USAF WASH DC
TO COMDR AFBND /ARDC/ INGLEWOOD
COMDR BMO /AMC/ INGLEWOOD
INFO COMDR ARDC BALTO MD

BT
/S E R E T FROM AFCGH. CITE 51210. PERSONAL FOR GEN RITLAND
FROM GEN MCCORKLE. REQUEST ADVICE AS SOON AS POSSIBLE AS TO ANY
RECOMMENDED ACTIONS AND THE ESTIMATED RESOURCES REQUIRED THEREFOR
THAT
COULD BE INITIATED TO FURTHER ACCELERATE THE ICBM/IRBM PROGRAMS.

CONSIDERATIONS INCLUDE ADVISABILITY OF INCREASING SIZE OF IOC FORCE,
ADVANCING SCHEDULES BY SIX PLUS MONTHS, EMPLOYING ALTERNATIVE BASE
CONSTRUCTION CONCEPTS, I.E., SOFT VS HARD FOR TITAN UNITS, ETC.

ESTIMATED RESOURCES NEED NOT BE LIMITED TO FY 59 BUDGET CYCLE AND MAY
INCLUDE INCREASES OF CURRENT FISCAL YEAR. INFO IS DESIRED BY CHIEF OF
STAFF FOR POSSIBLE HIGH LEVEL DISCUSSION. ADVISE SOONEST DATE REPLY
CAN BE FURNISHED. ANTICIPATED SIMILAR INFO WILL BE REQUESTED REGARDING
WS-117L PROGRAM. SUGGEST PREPARATORY ACTION ACCORDINGLY

BT
THIS IS AN AC MESSAGE
08/21372 OCT RJWPNF

"AC—PARAPHRASING NOT REQUIRED EXCEPT PRIOR TO CATEGORY B ENCRYPTION—PHYSICALLY REMOVE ALL INTERNAL REFERENCES BY DATE-TIME GROUP PRIOR TO DECLASSIFICATION—NO UNCLASSIFIED REFERENCE IF DATE-TIME GROUP IS QUOTED."

CUDSSAT-57-673
AF ITEM 1 [SECRET]
FOLLOWING IS TWX DISPETCHED TODAY--
REQUEST ADVICE AS SOON AS POSSIBLE AS TO
ANY RECOMMENDED ACTIONS AND THE ESTIMATED
RESOURCES REQUIRED THEREOF THAT COULD
BE INITIATED TO FURTHER ACCELERATE THE
ICBM/IRBM PROGRAMS. CONSIDERATIONS SHOULD
INCLUDE ADVISABILITY OF INCREASING SIZE
OF LOC FORCES ADVANCING SCHEDULES BY SIX
PLUS MONTHS EMPLOYING ALTERNATIVE BASE
CONSTRUCTION CONCEPTS I.E. SOFT VS HARD
FOR TITAN UNITS ETC ESTIMATED RESOURCES
NEED NOT BE LIMITED TO FY 59 BUDGET CYCLE
AND MAY INCLUDE INCREASES IN CURRENT FISCAL
YEAR. INFO IS DESIRED BY CHIEF OF STAFF
SOONEST DATE REPLY CAN BE FURNISHED.
ANTICIPATED SIMILAR INFO WILL BE REQUESTED
REGARDING VS-1171 PROGRAMS SUGGEST PREPARATORY
ACTION ACCORDINGLY.
END USAF ITEM 1 [SECRET]

AFBMD ITEM 1 [SECRET]
WILL TAKE A QUICK LOOK--
HAVE ANTICIPATED SOME OF YOUR QUESTIONS
BUT ANSWERS NOT IMMEDIATELY AVAILABLE
ESTIMATE PRELIMINARY ANSWER CAN BE
AVAILABLE WED PM VIA TWX.
THIS ALSO ANSWERS UR ITEM 2.
CONFIDENTIAL

USAF ITEM 3/SECRET/
WE DO NOT KNOW EXACT BACKGROUND OF ITEM 1 REQUEST; WE GUESS THAT IT IS ONLY FOR PURPOSES OF BEING PREPARED IN CASE TOP AUTHORITIES ASK WHAT WE NEED FOR OUR PROGRAMS. BASIS OF COURSE IS IMPLICATIONS OF SOVIET SATELLITE ACCOMPLISHMENTS WITH RESULTING POSSIBILITY OF DEMANDS ON OUR OWN BALLISTIC MISSILE YOUR BEST FIRST GUESSES AS 5-4256A PIECE FOR OUR CHIEF TO INITIATE CONVERSATIONS WHICH MIGHT LEAD TO FUNDING OUTSIDE NORMAL PROGRAM LIMITATIONS.
END USAF ITEM 3/SECRET/

"A—PARAPHRASE NOT REQUIRED EXCEPT PRIOR TO CATEGORY B ENCRYPTION—PHYSICALLY REMOVE ALL INTERNAL REFERENCES BY DATE-TIME GROUP PRIOR TO DECLASSIFICATION."

AFBMD ITEM 3/SECRET/
AFBMD UNDERSTAND BACKGROUND OF SITUATION AND WILL EXERT MAXIMUM EFFORT FOR PRELIMINARY ANSWER.
END ITE 3/SECRET/

GA

USAF ITEM 4/SECRET/
WE IN CONFERRING GROUP ARE THINKING IN TERMS OF HOW MUCH IMPACT THESE RECENT DEVELOPMENTS MIGHT HAVE TOWARD BREAKING FUNDING RESTRICTIONS. IT COULD BE POSSIBLE TO GAIN AS MUCH AS 200-250 MILLION FY 1958 AND 300-500 MILLION FY 1959 IF SUFFICIENT NATIONAL IMPETUS WERE PLACED ON THESE PROGRAMS INCLUDING 117L. WE WANT TO BE PREPARED TO STATE WHAT WE COULD DO WITH THE FOREGOING
CHM OR LESSER AMOUNTS CHM SHOULD THEY BE MADE AVAILABLE.
END USAF ITEM 4/SECRET/
AFBMD ITEM 4 /SECRET/
AFBMD UNDERSTANDS RE FUNDING RESTRICTIONS
PD FUNDS REQUIRED FY 55-59
WILL BE THOSE COMMENSURATE WITH
MAINTECH EFFORT CMH FACILITY BUILDUP
CMH OPERATION TRAINING AND
RECOMMENDED IOC BUILD UP.
END AFBMD ITEM 4 /SECRET/

USAF ITEM 3 /SECRET/
REUR ITEM 1. REPLY BY WED EVE NOT SOON ENOUGH/ YOUR BEST FIRST ESTIMATES NEEDED HERE BY TOMORROW AM WITH REFINEMENTS AS SOON THERE AFTER AS POSSIBLE
END USAF ITEM 3 /SECRET/

"A-PARAPHRASE NOT REQUIRED EXCEPT PRIOR TO CATEGORY 8 ENCRYPTION—PHYSICALLY SEED MOVE ALL INTERNAL REFERENCES BY DATE-TIME GROUP PRIOR TO DECLASSIFICATION."

AFBMD ITEM 5 /SECRET/
WE WILL REPEAT WILL GET SOMETHING OUT EARLY WEDNESDAY. OUR FULL EFFORT WILL BE ASSIGNED TO THIS TASK.
END AFBMD ITEM 5 /SECRET/

ARE U STILL THERE BA485AS? L

AFBMD ITEM 6 /UNCLASS/
THAT IS ALL HERE. ATEE ACTION IS UNDER WAY.
END AFBMD ITEM 6 /UNCLASS/

THAT'S ALL FROM HERE GAPLS

RGR AND OUT

TNXOUT

SECRET CONFIDENTIAL
REFERENCE TELECON 8 OCTOBER 1957 FROM GENERAL MCCORKLE TO GENERAL RITLAND WHICH REQUESTED A MAXIMUM PROGRAM EFFORT AND ESTIMATED RESOURCES REQUIRED FOR FY 58 AND FY 59 TO FURTHER ACCELERATE THE ICBM AND IRBM PROGRAMS. INCLUDED IS ESTIMATE FOR WS 117L. FOLLOWING MESSAGE IN 7 PARTS CLN.

PART I - GENERAL

ALL INFORMATION ON THE ATLAS CMM TITAN CMM AND THOR PROGRAMS ARE IN CONJUNCTION WITH ACCELERATION FROM THE BASE OF THE MACINTYRE ACCELERATED PROGRAM CONTAINED IN THE AFBMD BALLISTIC MISSILE DEVELOPMENT PLAN DATED 15 SEPTEMBER 1957. INCREASED COSTS REQUIRED FOR ACCELERATION ARE BASED ON AN ASSUMPTION OF APPROVAL TO INCREASE PROGRAM EFFORTS EFFECTIVE 1 NOVEMBER 1957. R&D PROGRAMS CANNOT BE ACCELERATED BEYOND DATES MENTIONED BELOW. SMALL FUND INCREASES HAVE BEEN INCLUDED WHERE NECESSARY IN OUR OPINION TO COUNTERACT AUSTERE APPROACH OF RECENT PROGRAMMING EXERCISES. THE FOLLOWING INFORMATION IS CONSIDERED PRELIMINARY.

PART 2 - ATLAS


B. THE INITIAL PHASE OF THE IOC IS LIMITED PRIMARILY BY HARDWARE AND TRAINING CONSIDERATIONS. BEYOND THIS POINT THE LIMITING FACTOR BECOMES THE CURRENTLY FIXED PRODUCTION RATE OF 4 MISSILES PER MONTH. LIFTING OF THIS RESTRICTION WILL ENABLE A MORE RAPID ACTIVATION OF LATER SQUADRONS AND ALLOWS COMPLETION OF 5 SQUADRONS IN THE SAME TIME.
PERIOD PRESENTLY REQUIRED FOR 4. THIS WOULD RESULT IN A COMPOSITE
SQUADRON AT CAMP COOKE AND A COMPLETE WING OF 4 SQUADRONS AT WARREN AFB
BY JULY 1961. THUS ONE ADDITIONAL SQUADRON WILL BE AVAILABLE WITHIN
THE SAME TIME PERIOD. FUNDS REQUIRED FOR THIS FORCE INCREASE ARE
$2.0 MILLION FY 58 AND $32.8 MILLION FY 59 FOR MISSILES AND EQUIPMENT
AND $2.0 MILLION FY 59 MCP FOR DESIGN OF THE 4TH SQUADRON AT WARREN.
C. ALTHOUGH THE ACTIVATIONS INDICATED IN THE PRECEDING PARAGRAPH ARE
THE MAXIMUM ATTAINABLE BECAUSE OF GSE AND CONSTRUCTION LIMITATIONS CMH
MISSILE PRODUCTION CAN BE INCREASED TO AUGMENT THE UNIT EQUIPMENT AND
PROVIDE ADDITIONAL FORCE CAPABILITY ON A RELOAD CAPABILITY. WITH A
PRODUCTION RATE OF SIX MISSILES PER MONTH COMMENCING SEPTEMBER 1959
CMH IT IS POSSIBLE TO PROVIDE A USE OF 12 MISSILES RATHER THAN THE
PRESENT 10. THIS INCREASE WOULD REQUIRE ADDITIONAL FUNDING OF
$15.8 MILLION IN FY 59,
D. PRESENT PLANNING DEFERS CONSTRUCTION OF A THIRD COMPLEX AT CAMP
COOKE AND PROVIDES THREE FULL SQUADRONS AT WARREN AFB. AS INDICATED
ABOVE CMH ONE ADDITIONAL SQUADRON CAN BE ACTIVATED AT WARREN AFB BY
JULY 1961. HOWEVER CMH AT THAT TIME CMH THE CAPACITY OF CAMP COOKE TO
TRAIN AND RETRAIN OPERATIONAL CREWS WILL BE EXCEEDED CMH AND ONE
ADDITIONAL COMPLEX WILL BE REQUIRED AT CAMP COOKE. CONFIGURATION
OF THIS COMPLEX SHOULD BE HARD OR SOFT DEPENDING ON THE NATURE OF THE

FOLLOW-ON FORCE. DECISION DATE FOR THIS COMPLEX WOULD BE NOT LATER THAN
JUNE 1959 WITH CONSTRUCTION FUNDING IN THE FY 60 MCP.
E. IT IS NOTED THAT TO ACCOMODATE THE WS-117L PROGRAM SIXTEEN MISSILES
ARE INCLUDED IN THE PRODUCTION PROGRAM THROUGH FY 61. FURTHER CMH
ONE LAUNCH COMPLEX AT AFMTC WILL BE LOANED TO WS-117L FROM MAY -
DECEMBER 1959. ALL FUNDING FOR THIS PROGRAM IS INCLUDED WITHIN THE
PART 3. TITAN PROGRAM
A. AN AUGMENTATION OF THIRTY MILLION DOLLARS IN FY 58 FUNDS AND
SEVENTY MILLION DOLLARS IN FY 59 FOR THE TITAN PROGRAM WILL PROVIDE
AN ACCELERATION OF THE COMPLETION DATE FOR FULLY EQUIPPING THE IOC
GROUP FROM JULY 1962 TO JANUARY 1962. REVIEW OF PROGRAM SCHEDULES
INDICATES THAT THE CRITICAL DATE ON THIS PROGRAM IS AVAILABILITY OF
DESIGN CRITERIA FOR CREW TRAINING AND OPERATIONAL BASE FACILITIES IN
AUGUST 1958. BECAUSE OF THIS FACT CMH SHORTER LEAD TIMES ON SOFT
VERSUS HARD BASE CONSTRUCTION OFFERS NO ADVANTAGES IN ADVANCING THE
FIRST OPERATIONAL DATE OF MAY 61.
B. THE ABOVE PROGRAM WILL REQUIRE THE FOLLOWING ACTIONS CLN /1/
MAXIMIZE EFFORTS TO OBTAIN DESIGN CRITERIA FOR CREW TRAINING AND
OPERATIONAL BASE FACILITIES PRIOR TO AUGUST 1958. /2/ INCREASE R&D
TEST FIRING RATE ABOVE THREE PER MONTH IN FY 1960. /3/ REACTIVATE
PAGE FIVE

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THE ACTION TO COMPLETE TEST STAND NUMBER 20 AT AFMTC. /4/ ACTIVATION OF TEST STAND B-4 AT MARTIN IN CY 1959. /5/ INCREASE NUMBER OF TRAINING STANDS AT COOKE AFB FROM THREE TO FOUR. /6/ DECREASE CREW TRAINING PERIOD FROM FOUR TO THREE MONTHS. /7/ APPROVAL OF IOC SITE SELECTION IN JANUARY 1958. /8/ APPROVAL OF SIMULTANEOUS CONSTRUCTION OF IOC SQUADRON SITES. /9/ APPROVAL OF MAXIMUM TITAN PRODUCTION RATE OF SIX PER MONTH BEGINNING APRIL 1961 TO PROVIDE INCREASE IN NUMBER OF MISSILES PER SQUADRON FROM TEN TO TWELVE.

PART 4. THOR PROGRAM

A. AN AUGMENTATION OF TWENTY MILLION DOLLARS IN FY 58 FUNDS AND SIXTY-FIVE MILLION DOLLARS IN FY 59 FOR THE THOR PROGRAM WILL PROVIDE THE FOLLOWING ACCELERATION FOR THE IOC. AN INCREMENT OF THE FIRST SQUADRON COULD BE DEPLOYED OVERSEAS IN APRIL 59 AND FULLY EQUIPPED BY AUGUST 59. SQUADRON WOULD BE DEPLOYED AT THREE-MONTH INTERVALS WITH FOUR FULLY EQUIPPED SQUADRON IN PLACE BY MAY 60. THIS REPRESENTS ADVANCES IN THE FULLY EQUIPPED DATES WITH RESPECT TO THE 15 SEPTEMBER PLAN OF FOUR MONTHS FOR THE FIRST SQUADRON AND EIGHT MONTHS FOR THE FOURTH SQUADRON. UNDER THIS SCHEDULE CMN TWO THOUSAND NAUTICAL MILES RANGE CAPABILITY COULD BE PROVIDED WITH THE THIRD SQUADRON. TO ACHIEVE THIS TWO-THOUSAND-MILE CAPABILITY CMN TEN MILLION DOLLARS ADDITIONAL

PAGE SIX

RJWPNF 1

IN FY 59 FUNDS WOULD BE REQUIRED. THE NEXT MONTHLY MANAGEMENT REPORT WILL CONTAIN THE REQUEST FOR THIS FY 59 FUNDING WHICH IS REQUIRED TO ACHIEVE THIS ADDITIONAL CAPABILITY UNDER THE 15 SEPTEMBER PLAN. THE DOLLAR FIGURES INDICATED FOR FY 58 AND FY 59 INCLUDE THE MONIES REQUIRED TO INCREASE THE INDUSTRIAL BASE TO PROVIDE FOR MAXIMUM DELIVERIES OF EIGHT MISSILES PER MONTH BY JULY 59. WITH THIS CAPABILITY CMN AN EIGHT SQUADRON IOC FULLY EQUIPPED WITH 120 MISSILES COULD BE IN PLACE OVERSEAS BY MAY 61. A FURTHER ADDITION OF TEN MILLION DOLLARS IN FY 59 FUNDING WILL BE REQUIRED TO INITIATE IMPLEMENTATION OF THE ADDITIONAL 4 SQUADRON TO COMPLETE 8 SQUADRON IOC MENTIONED ABOVE.

PART 5. WEAPON SYSTEM 117L

A. REFERENCE IS MADE TO WS 117L DEVELOPMENT PLAN DATED 16 JULY 1957 PRESENTLY IN DCS/D APD/SS FOR REVIEW AND APPROVAL. THE ACCELERATED PROGRAM PROPOSED. HEREIN FOLLOWS THE PROPOSAL CONTAINED IN REFERENCED DEVELOPMENT PLAN EXCEPT THAT THE FIRST ATTEMPT AT ORBITAL FLIGHT IS IN SECOND QUARTER CALENDAR YEAR 1959 INSTEAD OF FOURTH QUARTER CALENDAR YEAR 1959. IN ADDITION CMN THE 16 JULY DEVELOPMENT PLAN ASSUMED A MID-CY 57 CONTRACTOR GO-AHEAD. LACK OF PROGRAM APPROVAL TO DATE HAS RESULTED IN A GENERAL TIGHTENING OF THE DEVELOPMENT EFFORT AND REQUIRES ADDITIONAL FUNDS TO RECOVER LOST TIME. FURTHER CMN
PAGE SEVEN RJUPNF 1
US 117F FUNDING HAS BEEN MODIFIED TO INCLUDE THE COST OF ATLAS BOOSTERS IN FY 1958 AND MCP REQUIREMENTS WHICH MUST NOW BE MOVED INTO FY 1958 TO MEET ACCELERATED PROGRAM. ADDITIONAL ASSUMPTIONS PERTINENT TO THESE FIGURES IN THE ACHIEVEMENT OF THIS SCHEDULE ARE AS FOLLOWS CLN.
/1/ THE BASIC RECONNAISSANCE REQUIREMENT IS UNCHANGED EXCEPT AN EARLY DEMONSTRATION OF LARGE SATELLITE CAPABILITY IS DESIRED.
/2/ THE AIR FORCE SATELLITE PROGRAM IS GRANTED THE PRIORITY AND MANAGEMENT AUTHORITY RECOMMENDED IN TOP SECRET LETTER DATED 10 SEPTEMBER 1957 FROM COMMANDER AFBD TO COMMANDER ARDC CMH SHORT TITLE CMH PROTARS-CMM CONTROL NO. WDD-57-TS-75 CMH WHICH HAS BEEN TRANSMITTED BY FIRST ENDORSEMENT TO DCS/D CMH HQ USAF.
/3/ INITIAL R&D/ORBITAL/ LAUNCHINGS WILL BE MADE FROM PATRICK AFB IN MID 1959 AND WILL BE FOLLOWED IN LATE 1959 BY HIGH LATITUDE ORBITAL LAUNCHINGS FROM COOKE AFB.
B. TOTAL FUNDING REQUIREMENTS FOR THIS PROGRAM ARE CLN
FY 1958 - $99.2 MILLION
FY 1959 - $121.7 MILLION

END WS/17L

PART 6. SUPPORT AREAS

PAGE EIGHT RJUPNF 1
A. CENTER SUPPORT AREA. TO INSURE MEETING R&D SCHEDULES AT AFMC AND AFFTC CLN ADDITIONAL FUNDS REQUIRED ARE CLN
FY 1958 - $3.2 MILLION
FY 1959 - $4.3 MILLION
B. COOKE LAUNCH AREA INSTRUMENTATION.
/1/ IMMEDIATE DECISION ON PERMISSION TO FIRE FROM COOKE AFB WITH RELEASE OF $1.983 MILLION IN FY 1958 FUNDS AS REQUESTED IN TWX TO HQ USAF WDCB-7-3-E DATED 5 JULY 1957 FOR COOKE AFB INSTRUMENTATION AND RANGE SAFETY SYSTEM.
/2/ ADDITIONAL REQUIREMENT OF $0.5 MILLION IN FY 1959 FUNDS TO COVER EXPEDITING REQUIRED IN INSTALLING INSTRUMENTATION AND INCREASED REQUIREMENTS FOR ADDITIONAL SAFETY INSTRUMENTATION.
C. WEST COAST DOWN RANGE IMPACT AREA FOR ICM, Requires approval of NAVY PLANS FOR EXTENDED WEST COAST RANGE TO THE EXTENT REQUIRED TO SUPPORT BMD IMPACT REQUIREMENTS. THESE HAVE BEEN TENTATIVELY IDENTIFIED AS /58/ $2.0 MILLION FOR NAVY SOUTH COOKE AND $6.2 MILLION /FY 58/ FOR DOWN RANGE IMPACT AREAS SMCLN FY 59 $1.2 MILLION FOR OPERATING COSTS.
D. TRAINING. NECESSARY ACTION WILL BE REQUIRED BY NOT LATER THAN 1 NOVEMBER 1957 TO APPROVE AND AUTHORIZE THE ALLOCATION OF FUNDS.
REQUIRED FOR PHASE II TRAINING FACILITIES AS OUTLINED IN LETTER CMN
HQ CMM ATC CMN SUBJECT CLN "FACILITIES REQUIREMENT ESTIMATES FOR
MISSILE TRAINING" CMN DATED 7 MAY 1957 /APPROXIMATELY $1500
MILLION/. AE AND DESIGN SPECIFICATION CONTROL WILL CONTINUE TO BE
EXERCISED BY AFHMD.

E. MANPOWER. IN CONSONANCE WITH THE ABOVE PROGRAMS, THE PHASING OF
MANPOWER REQUIREMENTS WILL HAVE TO BE EXPEDITED FOR THE IOC PROGRAM.
THIS REQUIREMENT IS GENERATED BECAUSE OF THE MORE RAPID BUILD-UP IN
TACTICAL UNITS AND THE NEED FOR A CORRESPONDING BUILD-UP IN SUPPORT
UNITS AT AN EARLIER DATE. IN ADDITION CMN THE AFHMD WILL REQUIRE
IMMEDIATE AUGMENTATION IN PERSONNEL AUTHORIZATIONS TO PROVIDE THE
ADDITIONAL NECESSARY MANAGERIAL CONTROL FOR THE EXPANDED PROGRAM.
F. IRBM SITE SELECTION. URGENT FY 56 BUDGETING AND SITE SELECTION
ACTION FOR OVERSEAS SITES IS REQUIRED BY SAC FOR REALIZATION OF THE
SM 75 PROGRAM.

PART 7

RECAPITULATION OF ADDITIONAL FUND REQUIREMENTS

<table>
<thead>
<tr>
<th></th>
<th>FY 58</th>
<th>FY 59</th>
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<tbody>
<tr>
<td>ATLAS</td>
<td>28.9</td>
<td>74.5</td>
</tr>
<tr>
<td>TITAN</td>
<td>30.0</td>
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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

SCIENTIFIC ADVISORY BOARD TO THE CHIEF OF STAFF, USAF

REPORT OF THE SCIENTIFIC ADVISORY BOARD AD HOC COMMITTEE ON
ADVANCED WEAPONS TECHNOLOGY AND ENVIRONMENT

OCTOBER 9, 1957

This document consists of 23 pages
Copy 59 of 120 copies.

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

9 October 1957

NOTICE TO ALL AIR FORCE ADDRESSEES

1. This Scientific Advisory Board report is forwarded directly in order to make it available for your information at the earliest possible date. However, any comments or action desired as a result of this report should be handled through established military command channels. May we remind you of the following documents governing action on SAB reports:

(1) All Air Force personnel - AIR 20-30

(2) Hq USAF personnel - Consult DCS/D XII 11-24 (15 Feb 57)
   (Contact Major Philip B. Anderson, Jr., ARMD-EX)

(3) Hq ARDC personnel - Consult Memo of 2 April 1957, from the Executive Office of the Commander addressed to the Staff, Hq ARDC (Contact Lt Col L. Robinson, RDPL)

(4) ARDC Center personnel - Consult TMX RDPLC 3-39-E dated 29 March 1957 from Hq ARDC to all Centers.

[Signature]

CHESTER N. HASELT
Technical Director
Scientific Advisory Board
Office of the Chief of Staff
Introduction

By letter of 15 May 1957, Lt. General D. L. Putt, Deputy Chief of Staff, Development, United States Air Force, requested the Chairman of the Scientific Advisory Board to establish a special study group to conduct a review of the problems of national defense in cis-lunar space, with particular regard to their impact on future weapons technology and the operating environment in which these weapons might function. Accordingly, the Chairman of the SAB Board established the Ad Hoc Committee on Advanced Weapons Technology and Environment. This Committee met at the RAND Corporation on 29, 30, 31, July 1957 and was briefed by the Air Force and industry representatives. This is a report of the Committee.

General Putt's letter, the Committee membership, and the agenda of the briefings are attached as Appendices 1, 2, and 3.

Scope of the Report

The subject matter considered by this Committee covers a range from specific military weapons systems to scientific experiments. The weapon systems themselves deal with projects from those, such as the ICBM, already under active development to others that are mere theoretical
possibilities. The technical developments range from the various technical arts that underlie future military weapons systems to exceedingly pure research into the nature of the universe. In addition, it is apparent that an intelligent survey of this subject requires consideration not only of technical and military systems questions, but also of certain aspects of organization. This is so because the scientific and engineering factors are often so new or so entwined that a separate or special organization is needed to attack them. Accordingly, this report is divided into a number of major parts as follows:

1. Military Weapons Systems
2. Other Potential Military Uses of Space Technology
3. Scientific Research and Exploration of Space
4. Organisation
5. Some General Comments

1. Military Weapons Systems

The military weapons considered by the Committee, which have already had some degree of weapons system study, include ballistic missiles, reconnaissance satellites, manned and unmanned boost-glide vehicles, pseudo-satellites or satelloids, and anti-ballistic missiles, as described later in this report.

a. Ballistic Missiles

In the opinion of the Committee, ballistic missiles continue to deserve top priority over all these military weapons systems for
future Air Force development. A survey of future possibilities indicates very definitely that technical and mission extensions of present ICBM's exist. In fact, there are two quite different paths of development which would lead to two distinctly different second generation ballistic missiles. More specifically, by one program of research and development, it would be possible for the nation to have future ICBM's which, on a relative basis, are smaller, simpler, more accurate, of adequate range, and more highly effective, and will lend themselves to better readiness, dispersal, mobility, and economical high-rate production than the present ICBM's under development. On an absolute basis, such second generation ICBM's could provide capabilities of destroying hard targets with high probabilities. A somewhat different program of research and development which might parallel the first could provide second generation missiles having payload and range capabilities considerably greater than the first generation of the ICBM.

Both of these research and development programs would involve considerable improvements in guidance techniques leading to greater accuracy, expected advances in nuclear weapons technology leading to higher yield-to-weight ratios, and improvements in nose cone technology leading to higher speed, lower dispersal re-entry, as well as advanced staging and structural techniques. The first or smaller missile development program would take advantage either of recent improvements and expected development gains in solid propellant efficiency together with clustered
multistaging designs, or a liquid propellant of improved thrust-density performance probably of a storable type, with a motor of considerably increased reliability and improved operability. The second, or bigger payload, missile development program would take advantage of sizable increases in specific impulse of liquid propellants of different composition than the LOX-RP now used. This second type missile can result from a product improvement program on the first generation ballistic missile of the I.O.C.

In addition to providing improved military weapons, product improvements of the first generation ICBM's will provide boosters for launching satellites, which can be expected to have long-range usefulness to the Air Force. The smaller, improved ICBM's might well take over the major task of providing the inevitability of retaliation so essential as the major long war deterrent.

Improved ICBM's cannot be possible without a substantial program of advanced research and development to carry the propulsion, guidance, nose cone, and structural aspects of the missile system design into the better performance ranges which are seen to be technically feasible. Accordingly, the second generation of ICBM's must follow the first generation by some years. It is recommended that every effort be made to cut down the time required to take the next step. More specifically, the Committee recommends that the Air Force provide for these future second generation weapons systems by early, rather than late,
preliminary research and development. To start a crash program some years later, with the subsystem research and development having to parallel an overlapping weapon system development and initial production, will be much more costly in time and resources and will represent a substantial risk to the nation.

b. Military Satellites

Military satellites for reconnaissance and intelligence missions appear to the Committee to deserve the next priority amongst military weapons systems in the cis-lunar region. The potential capability on the part of an enemy nation of launching first and (even worse) second generation ICBM's against us, and the increasing need for knowledge of targets as well as enemy operations appear to require a virtual continual surveillance of the enemy nation. The military satellite offers a means for doing this technically in a way that has different political implications from any alternative reconnaissance approach. Although there is no guarantee that political pressure will not interfere with our maintaining such satellites in passage over any enemy country, the need is so great and the possibility of world opinion sanctioning such space operations is considered so good that the nation cannot afford to be without such a military system at the earliest practical date. In this connection, it is to be noted that, while the ICBM program automatically provides the bulk of the research and development that assures the boosting of such reconnaissance and intelligence payloads into an orbit,
it is necessary to insure that such other subsystems and devices as are needed to complete the full reconnaissance intelligence systems are under simultaneous substantial development. These subsystems and devices include sensing devices, data transmittal systems and satellite-borne power supplies.

There are other military weapons systems or military systems based on the use of satellites that appear to have sound technical possibilities, but the background work on them is not yet sufficient to justify the starting of the complete system development. These include satellite systems for improved world-wide communications and for weather prediction. Here, the Committee recommends a relatively lower priority systems study with an amount of accompanying technique and experimental exploration wherever there is a lack of a critical subsystem or data for sound systems analysis.

c. Other Military Vehicles

The Committee considered three other types of vehicles with potential military capabilities and agreed that some work should be done on all. These are the boost-glide system, the pseudo-satellite or satelloid, the manned, winged research vehicles such as the X-15 and X-15 follow-on.

The Committee considered boost-glide systems for bombing and reconnaissance purposes. Considering first versions of such weapons systems that do not include human operators or passengers, the Committee
recognizes that the use of a boost-glide trajectory, as compared with a more nearly true ballistic trajectory, may in the end offer certain advantages. The problem is one of correctly assessing the possibilities of a smaller take-off weight against what might be greater complexity in guidance, greater vulnerability, and clearly more severe structural and heating problems. The trade-offs may be very much a function of range and size of payload. Until there are more realistic evaluations of the pros and cons here, the Committee does not feel that any substantial systems development is indicated, but it does recommend continued paper studies on such systems and limited component research and development.

Somewhat related to the boost-glide principle are suggestions of pseudo-satellites or satellites in which one or more passes around the earth might be made and in which the altitude, speed, earth curvature, lift, drag, and gravity effects so combine that the trajectory for the most practical purposes can be viewed as that of an earth satellite at a lower altitude, say 50 to 80 miles. Here, again, any substantial military system or component development is out of order until there is further evaluation on a paper study basis.

The Committee gave special attention to the problem of human passengers in vehicles that are intended for bombing, reconnaissance, or any purpose that takes them to extraordinary altitudes or into satellite or nearly ballistic trajectories for long-range and related environmental situations. The Committee was not readily able to see impressive
instances in which the addition of a man could clearly provide some function better or more easily than potential electromechanical equipment. As we enter the range of velocities and altitudes that must be considered here, the possible contributions of the human operator shrink rapidly. On the other hand, the requirements to make possible his survival rise enormously. The provision for take-off and landing, the need for providing a suitable environment for the human operator in flight, and the provision of high reliability for safety sake, complicate the trajectory and the controls, add to the over-all weight by an order of magnitude or more, and add greatly to the cost and time of development, especially in the early stages of development. Accordingly, the Committee can see no justification for the starting of major weapons systems in the area covered by the Committee in which the system is designed around the inclusion of a human passenger.

At the same time it recommends against inclusion of the man in these weapon systems, the Committee recognizes the desirability of understanding better man's relationship to his environment as speeds, altitudes, and accelerations increase, and as additional environmental factors, such as radiation, become of greater importance. Accordingly, it recommends the continuation of such programs as the X-15, understanding these to be programs for the collection of important data rather than prototypes for future manned weapon systems. The value of the X-15 follow-on system must be considered very seriously before it proceeds.
beyond the paper study stage.

d. Anti-Ballistic Missiles

The anti-ballistic missile system presented to the Committee the most severe problem of evaluation and categorizing. On the one hand, it is recognized that this problem is sufficiently difficult and has enough new elements in it that the Committee would like to see more systems study and analysis and more experimental work on critical sub-system items, such as early warning and acquisition radar, before the Air Force launches into a full-scale military weapons systems development. On the other hand, it recognizes the urgency of the need for starting an anti-ICBM area defense system, especially in view of the second generation ICBM possibilities. A compromise would appear to be in order here, with the beginning, on a strictly controlled basis, of an anti-ICBM weapon system development while assuring that ample attention is given to the systems studies and the experimental foundations.

e. Nuclear Weapons Technology

Related to the above, but having broader implications as well, are two other questions. One has to do with weapons effects, and the other has to do more generally with the relationship of all of the weapons systems to advanced warhead possibilities. The Committee feels that the Air Force should press more strongly for an appropriate program that will bring forth better biological and physical data on the effects of nuclear warheads detonated at all heights but particularly at the higher altitudes and of the vulnerability of warheads and other equipment.
to the effects of nearby detonations at extremely high altitudes.

Attention is also called to the fact that the Committee based its thinking upon nuclear warheads and did not consider chemical or biological warheads. To the extent that the Committee was informed on these matters, it is felt that all of the recommendations in the preliminary report hold for all these classes of warheads.
2. Other Potential Military Uses of Space Technology

The Committee recognized that there have been numerous suggestions for new projects based upon vehicles in space well beyond the earth's atmosphere. From all presentations made to the Committee, and from its own deliberations, the Committee was not able to see any military application resulting from occupation of the moon for reconnaissance, communications, or strategic bombing purposes, or for the creation of space stations for bombing, satellites for active ICBM defense, satellites of the moon, or space ships to other planets. This is not to say that there are not technically feasible ideas involving the use of the moon or man-made space devices to participate in these military objectives. It is simply that in every instance it was believed that better approaches exist for meeting the military requirements with "global" systems. The Committee even considered such suggestions as the acquisition of the moon for the purpose of natural resources, but considered this exceedingly weak.

Nevertheless, the Committee realized that on a long-range basis the Air Force cannot afford to overlook the possibility that potential uses not now apparent may be discernible in future years. Accordingly, appropriate steps should be taken to insure at least that certain advanced technological fields are not overlooked that might later prove important in space conquest.

Another entirely separate reason for recommending that the Air Force have a certain minimum program in this field is the psychological warfare aspects represented by the effect on the nations of
the earth if an enemy nation becomes superior in space technology, i.e., "captures the moon," and in other ways based on space technology, progress creates the impression of technical, and hence military, superiority in the minds of other nations. Here it must be recognized that technical superiority and military superiority have in many ways become synonymous in the public mind of the world in general.

The Committee, for the above reasons, recommends Air Force research programs in a number of areas, and has selected these not only upon the basis of their potential use in general space technology, but because these techniques have broad possibilities and hence other substantial justifications as well. Thus, such items as magneto-hydrodynamics, with its possibilities for major advances in the aerodynamics and propulsion arts, and nuclear propulsion should both be studied. In these instances, it is not timely to consider any specific military tasks based on these techniques, but because of the break-through possibilities it is important that experimental work as well as theoretical studies continue at not too meager a pace. Similarly, electrical (ion) propulsion and work on solar batteries, on nuclear auxiliary power systems, and in shielding research should receive attention.

3. **Scientific Research and Exploration of Space**

Distinct from the research and development in improved techniques for advancing the general aeronautical or electrical art enumerated above, there remains the question of exploration of outer
space, and the acquisition of scientific data as to what goes on in outer space. Here, for example, we do not seek to develop magneto-hydrodynamic forces with the idea of applying them to propulsion and other applications. Instead, we merely ask the question of what is true about the universe in a region where man has not previously been able to make direct observations.

It is the Committee's belief that the Air Force has a mission to perform in this pure research area. In this area, Air Force laboratories and contractors have already made substantial contributions.

One reason for the Air Force's continued participation is that, as a service highly dependent upon new scientific developments, the policy has already been recognized that it should make a contribution to pure research that does not directly tie to a military application. It must be anticipated, in other words, that the superior knowledge of nature that will result from observations in space will have repercussions on our ability to apply science generally to the military problems. For example, basic radiation is an important item in the list of scientific phenomena applied widely by the military, and observations on radiation in outer space could be expected to accelerate our understanding of fundamental laws of energy release and transmission.

However, there is another reason for Air Force interest in exploration of space that is somewhat more special to the Air Force as a service than to other government agencies. This is that the Air Force is the service with proper cognizance over military weapons systems.
that provide means for carrying instruments out into space. The Air Force is the logical service to supply much of the physical requirements for such a research program. Just as the Navy is the logistics branch of the government to bring the bulk of the scientific data back from the Antarctic, so the Air Force is the logical military service to be assigned the job of logistics for space data collection. In particular, it is to be noted that the ICM provides a platform with launching and ground handling equipment that makes possible outer space scientific data collection with a minimum extension from the purely military programs. No other government group is in a similar position.

4. Organization

The Committee recognizes that in a number of respects the Air Force is not yet organized to make possible the most efficient handling of its future role in the fields discussed above, and as a result certain specific recommendations are made with regard to organization.

Ballistic missile programs of the Air Force, and programs very closely related to them and using common apparatus and facilities, including military satellites, should continue to be managed by the Air Force Ballistic Missile Division, ARDC. While this appears to be the plan of ARDC, and while every action taken on these projects to date confirms this, the Committee was concerned to note that there is not yet an official understanding that AFMSD is a permanent organization.
set up to cover this role into the future. Accordingly, explorations and decisions on future possibilities in the ballistic missile and satellite area cannot proceed with the maximum effectiveness. The Committee urges that AFEMD be recognized at the earliest possible date as a permanent organization for ballistic missiles and satellite projects.

As to other military weapons systems developments systems studies, and subsystem experimentation intended as a preliminary to, or as a back-up of, such advanced military systems, the Committee believes that the present ARDC organization provides the necessary management centers and means of control of communication. No special organizational rearrangement is indicated for these purposes alone. (The Committee is aware that for a number of reasons ARDC, in common with other large complexes continually meeting new problems, has organizational problems, and that organizational changes reflecting the solution of these problems no doubt will be made. It is endeavoring here to single out for special mention only those aspects within the province of the Committee.)

Special organizational patterns must be created for the pure research projects indicated above. Here the Committee suggests that the Air Force should seek to set up at high ARDC level a committee which combines appropriate representation from the Air Force and from the scientific body of the nation at large. The mission of this Committee
is to advise the Air Force on the selection of the most important scientific experiments which will be carried out in this program to make available Air Force aid to scientific researchers, and to disseminate to scientists knowledge of our research service and ability in these fields. This committee should be chairmanned by a high-level ARDC officer, and its specific members should include representatives from scientific bodies outside of the Air Force (such as the National Academy of Science); the Scientific Advisory Board, ARDC Centers that will be concerned with space technology research, and the operating agencies with ARDC that are likely to be chosen for the executive control of individual projects. In setting up this committee, it should be recognised that it is advisory only, and that the chairman will be expected to exercise the Air Force responsibility, making whatever use ARDC's judgment dictates is proper of the advice rendered by the committee. When a specific project is to be carried out, ARDC should select one or another of its Centers or other management agencies for the program execution. Specifically, however, it is recommended that whenever scientific data collection depends heavily upon the use of ballistic missiles or important parts thereof, both as to airborne or ground apparatus, or, similarly, parts of military satellite systems, or otherwise has a relationship to the scheduling and launching of projects of AFEMD, AFEMD be made the executive agency for the execution of the scientific program.
The Committee had the benefit of a briefing covering essentially the material contained in RAND Report 8-53: "Space Flight and the Air Force" by R. W. Buchheim. This excellent and highly "sensible" report discusses at some length the possible military and scientific justifications for an Air Force Space Flight program, and outlines a fairly specific scientific program which could reasonably be undertaken in the near future. The Committee's recommendations, although much less specific, are not inconsistent with the conclusions of the RAND Report.

The ARDC contractors who presented briefings to the Committee were seriously handicapped because of the short time allotted for the presentation of their thoughts. Still, they did an excellent job in presenting their most interesting ideas.

The Committee would like to thank the Secretary, Chester Hasert, for the difficult arrangements for such a concise program.

AD HOC COMMITTEE ON ADVANCED WEAPONS TECHNOLOGY AND ENVIRONMENT:
Dr. H. Gayford Stever, Chairman
Mr. Chester N. Hasert, Secretary
Prof. Joseph Kaplan
Dr. Clark B. Millikan
Dr. Mark M. Mills
Prof. W. H. Radford
Dr. Simon Ramo
Dr. Clayton S. White
APPENDIX II

MEMBERSHIP OF THE SCIENTIFIC ADVISORY BOARD AD HOC COMMITTEE ON ADVANCED WEAPONS TECHNOLOGY AND ENVIRONMENT

Dr. H. Guyford Stever, Chairman
Professor Joseph Kaplan
Dr. Clark B. Millikan
Dr. Mark M. Mills
Professor W. H. Radford
Dr. Simon Ramo
Dr. Clayton S. White
Mr. Chester E. Hasert, Secretary
MEMORANDUM FOR CHAIRMAN, SCIENTIFIC ADVISORY BOARD

SUBJECT: SAB Special Study of Advanced Weapon Technology and Environment

1. Reference is made to your memo of February 20, 1957, transmitting the report of the Fuels and Propulsion Panel, which suggested special studies, on a broad basis, of the problems of national defense in cis-lunar space.

2. In accordance with your suggestion, I would like the SAB to establish such a special study group, to review these problems with particular regard to their impact on future weapon technology and the operating environment in which they may function.

3. The present trend of technology in ballistic vehicle development seems to indicate an early capability of rocket type vehicles to reach new regions of cis-lunar space. This suggests the possibilities of military operations in completely new environments. The attendant technological problems of vehicle design, propulsion, weapons effects, communications, human factors, strategy and tactics, and many others, need careful investigation. The severe impact on military operations makes it imperative that the Air Force keep abreast of the latest thinking in these areas and to be immediately informed of potential breakthroughs.

4. Studies are presently underway at the Remo-Wooldridge Corporation, in conjunction with WDD and HQ USAF. It is suggested that the SAB committee review the work of these groups (which should be available in August) as well as studies at the RAND Corporation and industry groups which are considering these problems.

5. It is requested that this committee advise the Air Force with regard to the status of present technological knowledge in this field, and the recommended direction of future programs, for both supporting research to explore this new environment and the study of future weapon systems.

(signed)

D. L. PITT
Lt. General, USAF
Deputy Chief of Staff, Development

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DOD DIR 5200.10

CONFIDENTIAL
APPENDIX III

24 July 1957

SAB SPECIAL STUDY OF ADVANCED WEAPONS TECHNOLOGY & ENVIRONMENT
29-31 JULY 1957
THE RAND CORPORATION, SANTA MONICA, CALIFORNIA

AGENDA

MONDAY - 29 July 1957

0900 - Executive Session
0925 - Introduction - Dr. H. Guyford Stever
0930 - Directorate of Development Planning, DCS/Development, Hq USAF

( Lt Col Ryan)

ARDC BRIEFING

0945-1000 - ARDC Keynote Speech - Brig Gen Marvin C. Decker, Dep Cdr, R&D, Hq ARDC
1000-1025 - Selected Systems Studies - Col. Augustus Frantiss, Jr.,
Director of Systems Plans
Dep Cdr, Weapon Sys, Hq ARDC

5 min Discussion

1030-1040 - BREAK

1040-1055 - Contributions of the AFRMD Progress to Future Weapons -
Col. Frederick Odor, Director of System 117-L's AFRMD

5 min Discussion

1100-1130 - Propulsion, Secondary Power, and Vehicle Design
Mr. Ezra Katcher, Tech Dir, Dir of Labs, RADC

5 min Discussion

1135-1155 - Guidance and Control - Mr. James Burke, Tech Adv, Dir of
Air Weapons, Dep Cdr, R&D, Hq ARDC

5 min Discussion

1200-1300 - LUNCH

1300-1310 - Communications, Major Edward Wright, Chf Com Div, Comms &
Elec Dir, Dep Cdr, R&D, Hq ARDC

5 min Discussion

1315-1335 - Human Factors - Brig Gen Donald Flickinger, Dir of Human
Factors, Dep Cdr, R&D, Hq ARDC

10 min Discussion


1345-1415 - Geophysics - Dr. Murray Zelikoff, Chf of Photo-Chim Lab, Geophysics Res Dir, AEC

5 min Discussion

1420-1445 - Research Trends - Dr. Morton Alperin, Dir of Office for Advanced Studies, AFOSR

5 min Discussion

1450-1515 - Summary Discussion of the AEC Presentation

TUESDAY - 30 July 1947

0900 - Executive Session

0915 - RAND Presentation (R. Buchheim)

1115 - Break

Each of the following presentations are closed to industry representatives other than the company making the presentation:

1130 - Aerocommunications Systems, Inc. (E. Krause)

1200 - LUNCH

1300 - Aerophysics Development Corp. (W. Bollay)
1330 - Boeing Aircraft Co. (E. Longfielder)
1400 - Bell Aircraft Co. (W. Dornberger)

1430 - BREAK

1500 - Convair Astronautics Division (H. Friedrich)
1530 - Douglas Aircraft Company (E. Wheaton)
1600 - Lockheed Missile Systems Div. (L. Hidenour)
1630 - Martin Company (G. Trimble)
1700 - North American (R. Wilson)
1730 - Adjourn

WEDNESDAY - 31 July 1947

Executive Session
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

Scientific Advisory Board to the Chief of Staff

APPENDIX IV

DISTRIBUTION OF THE SCIENTIFIC ADVISORY BOARD REPORT OF THE ADV HOC COMMITTEE ON ADVANCED WEAPONS TECHNOLOGY & ENVIRONMENT

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Systems Plans
Tactical Systems Division
Logistics & Training Systems Division
Strategic Systems Division
Pre Planning Branch
Intelligence and Reconnaissance Systems Division
Research & Target Systems Division
Ballistic Missile Defense Office

HQ (HQO) DETACHMENT A
Commander

Director of Nuclear Systems

BALLISTIC MISSILE DIVISION (Inglewood, California)
Commander

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Dr. Clark B. Millikan
Dr. Mark H. Mills
Prof. W. H. Reedford
Dr. Simon Ramo
Dr. Clayton S. White

The Rand Corporation, 1625 Eye St., NW (Washington Office)

The Rand Corporation, Santa Monica Office, (Attn: The Director via USAF Liaison Office 106
The Rand Corp. 1700 Main St.)

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WPAFB, OHIO

CONFIDENTIAL FROM WDTR 10-9-5 FOR COLONEL NUNZIATO-ARDC: INFO AT
HQ USAF FOR COLONEL CULBERTSON-ARDC; COLONEL HARVEY POWELL-ARDC:
INFO ARDC FOR COLONEL WORTHMAN-EDZW; INFO AMC FOR MCPZ PD

ANALYSIS OF COMMITMENTS BY LOCKHEED ON WS 117L PRIME CONTRACT AF
01(617)-97. INDICATES THAT EIGHTY FIVE PERCENT OF THE PRESENT CONTRACT
Funds WILL BE COMMITTED BY LOCKHEED AS OF 1 NOV 57 PD. IT IS
ANTICIPATED THE CONTRACTOR WILL STOP ALL WORK ON THAT DATE UNLESS
ADDITIONAL FUNDS HAVE BEEN DELEGATED AGAINST THIS CONTRACT PD
PENDING APPROVAL OF THE TOTAL FY 58 P-100 AND P-200 PROGRAM FOR WS
117L CMM IT IS URGENTLY REQUESTED THAT AN INTERIM PROCUREMENT
AUTHORITY IN THE AMOUNT OF AT LEAST $4 MILLION OF P-100 FUNDS AND
$1 MILLION OF P-200 FUNDS BE ISSUED TO ARRIVE AT THIS HQ NO LATER

WDTR

Captain David Bradburn

1171-72 1 2

/s/ Charles H. Terhune, Jr.

CHARLES H. TERHUNE, JR.
Colonel, USAF
Deputy Commander
Weapon Systems

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED TODAY DIR 5200.10
25 OCT 57 PD IT IS EMPHASIZED THAT A WORK STOPPAGE WILL OCCUR UNLESS ADDITIONAL FUNDS ARE PLACED ON THIS CONTRACT BY 1 NOV 57 PD
MEMORANDUM FOR GENERAL LEHAY

10 October 1957

SUBJECT: WS 117

I have approved the program recommended by the Air Council as a planning objective with the understanding that I will have the opportunity to again review the program in the amount of funds required in FY 58 based on the funds proposed and that Mr. Quarles, D. S. D. will also have the opportunity to review the program. This will probably have to go to the President.

/s/ JAMES DOUGLAS
Secretary of the Air Force
SECRET CITE AFFORD-SS 51476. THIS IS CATEGORY AC MESSAGE.
REF: WDT-10-8-8 DDP 10 OCT 57. PROCUREMENT AUTHORIZATION 58-95 ARS
WS 117L, CONTROL SYMBOL 58-131-15 IN THE AMOUNT OF 35.1 MILLION
DOLLARS P-200 FUNDS WAS ESTABLISHED ON 11 OCT 57 AND TRANSMITTED TO
CONOR AND, ATTN CDM NCIP. P-200 FUNDS NOT YET AVAILABLE AND WILL BE
RELEASED AS EARLY AS PRACTICAL
BT
.15/2750Z OCT RJWPNF

WDSSAT 57-697

DECLASSIFIED AT 12 YEAR.
INTERVALS: NO AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.1G
17 October 1957

Lt. Gen. M. E. Anderson
Commander
Air Research & Development Command
P.O. Box 1395
Baltimore 3, Maryland

Dear Sam,

As you would expect, the Russian launching of an earth satellite has caused considerable alarm not only in the Air Force but also in the Department of Defense. Just yesterday, 16 October, we briefed the Deputy Secretary of Defense, Mr. Quarles, on the advanced reconnaissance system, weapons system, IIL. Unfortunately, Mr. Quarles still seemed to be rather cold on our planned program. In addition, at this meeting were Mr. Douglas, the Secretary of the Air Force, General LeMay, Assistant Secretary of Defense, R&E, Dr. Borto, and Assistant Secretary of the Air Force, Mr. Hornor, and a number of other representatives from the Office of the Secretary of Defense and Office, Secretary of the Air Force.

Subsequent to the meeting General LeMay and I met with Mr. Douglas, and it is Mr. Douglas' desire that the Air Force look into all possible schemes that might entail the Air Force to do something spectacular in the satellite field. We discussed such things as the possibility of putting a larger satellite on orbit, or even such schemes as putting a satellite on a moon orbit, and perhaps shooting a satellite to the moon either with instrumentation or perhaps with a small bomb, nuclear weapon. The possibility of putting a small satellite with instrumentation on the moon. In fact, this has just recently been studied by RAND. The conclusions of their study are reported in RAND Report No. R-307.

I believe that it would be advantageous for us to look at this problem in two respects: (1) On a basis of no interruption of the ICBM-IRBM programs. This would limit us to using such hardware as the NAVAFC boosters, the X-17 vehicle, etc. The other aspect would be using whatever we have including the ICBM-IRBM hardware.
Ltr to Gen Anderson fr Gen Putt

The timing of such a scheme could be most critical since there have been reports that the Russians may announce some new development around the 7th of November celebrating the 50th Anniversary of the Soviet Revolution. I realize that this date is close at hand and we certainly cannot put anything in the air by this date, but perhaps we may have some announcement that we might make. The other critical date and certainly more critical from a U.S. prestige viewpoint is March 1956 when the U.S. is to launch its own scientific satellite on VANGUARD. I am sure that you have been abreast of the VANGUARD Program and realize that it is marginal at best so that you may be thinking of these schemes that Mr. Douglas would like investigated as perhaps a backup should the VANGUARD fail or should not produce the desired world reaction.

I realize that looking into some of these schemes may be rather difficult. I think it would be advantageous to call in industry to assist us. We have just recently heard that North American Aviation is preparing a program for using the NAVAHO-X17 combination. I think it would be wise to discuss this with others as well as North American.

Please let me know as soon as possible schemes that the Air Force might submit to any DOD pressure or Executive pressure for us to propose a spectacular event in the near future. I would also appreciate names of individuals whom you have designated in ARDC to monitor this effort. I have assigned this particular effort to my Assistant for Special Projects, Col Ralph J. Nuzziato, in order that they may work together.

D. L. PUTT
Lieutenant General, USAF
Deputy Chief of Staff, Development
RECEIVED
WIT ARDC
19 OCT 1957

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/C.O.N.F.I.D.E.N.T.I.A.L/ FROM AFMP 018E-51,689. CONAMC FOR MCAPPD
REFERENCE PA 58-95/ ARS W3 1171/. YOU ARE HEREBY DIRECTED TO LIMIT
OBLIGATIONS AND COMMITMENTS ON REF PA 58-95 TO $15.5 MILLION THRU
JAN 1958. THE BALANCE OF FUNDS ON REF PA 58-95 WILL BE HELD IN
ABYANCE PENDING REVIEW OF PROGRAM BY HIGHER AUTHORITY. THIS LIMITATION
IS NOT INTENDED TO REDUCE PLANNED RATE OF EFFORT THRU
JAN 1958.
BT
19/00372 OCT RJWPNF

DOWNGRADED AT 12 YEAR
INTERVALS. NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10
WS 117L Acceleration

MDTR

25 Oct 57

1. Reference 1 a: Hq USAF Telecon 8 Oct 57
   1 b: ABMB TMX of 9 Oct 57
   1 c: Briefing of Soper Team

Paragraphs WS 117L:

Further analysis of the effort proposed by reference 1 a and as answered by references 1 b and 1 c as well as discussions with members of Colonel Soper's team reveals no change in the requirements for acceleration of the WS 117L program. It should be noted that the fund requirements cited in reference 1 b for WS 117L are total fund requirements of $99.2 million in FY 1958 and $121.7 million in FY 1959. As presented to members of Colonel Soper's team the principal effects of such funding would be to:

a. Make possible first orbit flight of the WS 117L vehicle in the second quarter of Calendar Year 1959 rather than at the end of that year.

b. Advance the availability of the visual subsystem by approximately six months.

c. Advance the availability of the ferret subsystem by nine to twelve months.

d. Provide earlier construction of the earliest need facilities.

e. Provide earlier procurement of the SM-65 missiles used as boosters for the WS 117L.

2. Inasmuch as WS 117L is not as far along as are the other major weapon systems covered in this letter further definition as to acceleration cannot be reliably estimated at this time.

SIGNED

FREDERICK C. E. ODER
Colonel, USAF
Director WS 117L

DOWNGRADED AT 12 YEAR INTERVALS; AUTOMATICALLY RECLASSIFIED. DOD IN 5200.10

WDTR 57-376
MEMORANDUM FOR THE RECORD
OCT 25 1957

SUBJECT: Briefing of Deputy Secretary of Defense, Mr. Quarles on
WS 117L (ABS) on 16 October 1957

1. The purpose of this memorandum is to record the gist of the
actions occurring during and after the subject briefing. In addition to
Mr. Quarles those present (this is to the best of my knowledge since I
wasn't introduced to them all) were:

Mr. James Douglas, Secy. of the Air Force
Gen. Curtis E. LeMay, VC of S, USAF
Dr. Foote, ASD (R&E)
Mr. W. H. Francis, ASD (M, R&E)
Mr. R. E. Horner, ASD (R&D)
Mr. J. B. Macnally Dep ASD (R&E)
Dr. H. R. Skillett Spec. Asst. to ASD (R&E)
Dr. Townsend, OASD (R&E)
Brig. Gen. O. J. Ritland, AFBMD (ARDC)
Col. B. H. Harris, Jr. OASAF (R&D)
Col. E. A. Kiesling, Asst for GM, Hq ARDC
Col. F. C. E. Oder, AFBMD (ARDC)

2. In his introduction to the briefing by the undersigned, General
Putt reviewed the history of WS 117L from 1945 to the present, the
recommendations of the Air Council as of approximately 16 September 1957,
the fact that the program under consideration was developed prior to the
recent Soviet launching of an earth satellite ("Sputnik") and that the
basic purpose that WS 117L was to provide a reconnaissance capability.
This latter point was emphasized by General LeMay who stated that during
its deliberations the Air Council reviewed all proposed reconnaissance
systems planned for the period subsequent to 1962 and had unanimously agreed
that WS 117L should be given maximum effort and other less promising approaches
had been terminated.

3. The undersigned covered the following points: current technical status
of the program, possible future military applications of satellite vehicles
(included by direction of Hq USAF in par 1 of their Secret TWX cite AFDNC-SP
51117, date-time 1121117Z October) and the details of the program envisaged for
FYs 1958 and 1957. Mr. Quarles raised several specific questions during the
briefing which were answered to Mr. Quarles' apparent satisfaction. Mr.
Quarles took very strong and specific exception to the inclusion in the pre-
sentation of any thoughts on the use of a satellite as a (nuclear) weapons
carrier and stated that the Air Force was out of line in advancing this as a
possible application of the satellites. He verbally directed that any such
applications not be considered further in Air Force planning. Although both
General LeMay and General Putt voiced objection to this direction on the grounds
that we had no assurances that the USSR would not explore this potential of
satellites and could be expected to do so, Mr. Quarles remained adamant.
h. In the discussion following the prepared presentation, Mr. Quarles stated that for cold war purposes (i.e., "counter-Sputnik") one should consider a less sophisticated approach (than WS 1171) and that one should not attach much cold war significance to this program. Based upon the view that the program presented was "pre-Sputnik" and was for reconnaissance purposes both Mr. Douglas and General LeMay concurred in this view. Mr. Quarles' expressed views appeared to be somewhat contradictory since on one hand he stated that "this program (ARS) ought to be kept in a planning atmosphere" while on the other he stated that "I agree that there should be an aggressive Air Force project on a reconnaissance satellite". Mr. Douglas and General LeMay again pointed out forcefully that the need for reconnaissance was strong and that the Air Council had carefully considered all reconnaissance programs either proposed or under development for the time period concerned and on the basis of this analysis had recommended that the ARS go ahead as fast as possible, consistent with good management and that other less promising approaches to this critical problem (reconnaissance) had been terminated. Mr. Quarles then said that there were a number of uncertainties in the program (ARS) and that he felt that the Air Force developers were taking an over-optimistic view of the problems involved. To this General Putt pointed out the careful reviews and wholehearted endorsements of the technical aspects of the program by the President's Science Advisory Committee in 1956 and 1957, as well as, continuing review by the Air Force Scientific Advisory Board whose most recent recommendation in the late summer of 1957 was that ARS should be given a priority, second only to the ICBM. General Putt also pointed out that the ARS was under the management of the Air Force Ballistic Missile Division which had an excellent reputation for effective and efficient management. Mr. Quarles then questioned the rate for which funds were proposed for the ARS program and after this was again reviewed in detail he still appeared to resist the level of effort considered essential by the Air Council. Mr. Horner pointed out to him that the next best reconnaissance program (to ARS) which was considered (which is a highly classified program) would cost over three times as much and had even more difficult problems (and less long term utility) associated with it.

5. The meeting was terminated without resolution of the matter at hand. The suggestion was made that Secretary Mckirroy be briefed on ARS.

6. As a result of a subsequent meeting between Secretary Douglas, General LeMay and General Putt, the undersigned was advised (during a meeting with General Putt, Col. Kessling, Col. Numaino and the undersigned) that:

a. This (the reconnaissance satellite) is a national problem and an Air Force budget problem. Mr. Douglas could not take a final position on the program presented but hoped to have this resolved within two weeks. General Putt was of the opinion that this resolution might require as much as two months.

b. Secretary Douglas was certainly amenable to the view that this (the Air Council recommended effort) was a minimum program.

c. AFHMD was asked to determine the funds needed to keep the present contract in force at a better rate than the present rate (this action was taken by a telephone conversation between Col. Numaino AFHMD-SP and representatives of the AFHMD project office on 18 October 1957). A memorandum For
Record, dated 18 October 1957, Subject, "Telecon between Col. Hunsisto, Col. Odar, Lt. Col. Seay, and Major Zalanka", covers this agreement which was confirmed by Hq USAF Confidential TMX cite AFMP51689 date-time 18205Z October 1957).

d. Factors concerning the possible briefing to Secretary McElroy were discussed but no time, date, nor location was established.

e. Hq ARDC was to establish a group to look at all possible schemes the Air Force could come up with for a counter to Sputnik which might be both unique and quickly done. Col. Kieszling took this as an action item with a 1 November 57 deadline.

f. DCS/D was to prepare a brief statement to review the entire reconnaissance program.

g. AFRMD was to assemble a study which would highlight in more detail the as yet unresolved problems on the ARS, to indicate their nature and schedule for solution including test dates, e.g. the data link, etc. The WS 117L Project Office will assemble this data together with Lockheed Missile Systems Division. No specific deadline was given.

FREDERIC C. E. EDER
Colonel, USAF
Director, WS 117L
MEMORANDUM FOR GENERAL PRITLAND AND COLONEL TEREHUE

SUBJECT: Trip Report

1. This will report on my attendance at the 8th International Astronautical Congress, Barcelona, Spain, 6-12 October and my visit to the European Office of ARDC on 15 and 16 October, 1957.

2. This Congress was the 8th annual meeting of the International Astronautical Federation (IAF). All meetings have been held in Europe, previous locations being Paris, London, Stuttgart, Zurich, Innsbruck, Copenhagen, and Rome. The next Congress is scheduled to be held in Poland. Twenty-five organizations from twenty-one different countries are now members of the IAF. The total membership of these organizations exceeds 11,000. The general aims and objectives of the IAF are as follows:

   "a. The IAF shall exist to promote and stimulate the achievement of space flight as a peaceful project."

   "b. The IAF shall do all in its power to secure the widespread dissemination of technical and other information on space flight through the medium of exchange of publications, collaboration on research, etc. as between its members."

   "c. The IAF shall do all in its power to stimulate public interest in support for the idea of space flight through the medium of books, press, lectures, radio, film, etc."

   "d. The IAF shall do all in its power to stimulate work on astronautical subjects by international and national research and development establishments, universities, commercial firms, individual specialists, etc."

3. The published program of the technical sessions is attached. Some substitutions were made and some papers were omitted completely. Of the 44 scheduled, 23 were U.S., the remaining 21 were from ten countries, 5 being from the USSR. Copies were obtained of all the papers that were available and the list of these is attached. These papers are on file in WDPL for the use of anyone interested. Most of the papers are in English. Abstracts of the three Russian papers on Satellites are available in English and the abstract on the Russian paper on "Some Problems Relating to Dynamics of the Flight to the Moon" is available.
in English, but the complete papers are not available. The complete paper on "Investigation of Cosmic Radiation by Means of an Artificial Earth Satellite" is available in Russian but no translation is presently available. One copy of the paper "The Nature of Cosmic Radio Emission and the Origin of Cosmic Rays" by V. L. Ginzberg, Academy of Sciences of USSR, Moscow, is available. This latter paper however, was not given.

4. For a normal technical session the papers in general would have been considered very good. However, due to the launching of "Sputnik" two days before the opening of the Congress, most of the papers seemed to me to fall pretty flat. Nearly all of them were on theoretical work with some getting very lightly into experimental work but none, with the exception of four of the Russian papers and the papers by Major Simons and Otto Winzen covering the "Manhigh" project dealt with development work. There was an extremely good turnout for these two U.S. papers which were well illustrated with slides and movies and the presentations precipitated considerable discussion. The session at which these papers were given was the only one where the attendance exceeded the seating capacity. Another reason for the good attendance may have been the fact that other films were shown at this time. One Rocket Engine Test Station film was shown on rocket firings and the Disney film, "Man in Space" was shown.

5. Among Army personnel present were Generals Toftoy and Barclay. General Toftoy gave a resume of the Army Missile Program covering Honest John, Little John, LaCrosse, Hawk, Corporal, Nike-Ajax, Nike-Hercules, and Redstone. This talk seemed a little out of place sandwiched as it was between more technical papers. He did mention Bumper-Wac and that 80 V-2s had been instrumented to obtain scientific data. He also mentioned some results of radar tests aimed at the moon and the satellite capability that the Army had. This was an added paper apparently inserted in an attempt to counteract some of the Russian publicity. To me it fell far short of doing this. I think that it must have been apparent to everyone that not only were the three U.S. military services not together on an approach to the satellite and space vehicle problems but the entire U.S. effort was completely uncoordinated. Although much more work is apparently going on in the U.S. in this area than in any other country including the USSR, it is being done pretty much on an individual basis with no one tying all the bits and pieces together and directing the effort. Many companies, universities and government organizations have tackled portions of the problem in which they are interested. The Russian satellite papers in contrast were on development work that they are doing or have done. This was proven by their launching of Sputnik. By analogy I would assume that they also have an active project on a lunar vehicle, inasmuch as one of their papers was devoted to this subject.
6. The Russians exploited fully every opportunity to create a good impression. At the beginning of Madame Nasevich's talk she made a point of stating that although the paper was entitled "Preparation for Visual Observation of Artificial Earth Satellites" that it was obvious by now that the preparations had been completed successfully and were an accomplished fact. At the end of her talk she donated a model of their tracking telescope to the Spanish Astronautical Society with the "hopes of cooperation in the establishment of observation stations in Spain". Even their announcement that two of their papers on the Satellite could not be given because the authors were not present was done in a rather dramatic fashion, implying that they were at home actively involved in their project.

7. Some additional information obtained from Leonidas Sedov during discussions outside the Technical sessions will be of interest. In response to a question as to how much of the satellite effort had been Russian and how much they had depended upon Germans, he answered in the following fashion: "that anyone could have done this ten years ago if they had followed up on German engine development. He stated that all one had to do was use two A-10 engines for the first stage booster, the V-2 engine for the second stage and a Wassertan engine for the third stage and one would be able to get a satellite into orbit!" There are several versions of the A-10 engine development but he did not indicate any thrust. Whether or not they actually used these German designed engines or modifications of them I do not know but that was certainly implied. It was also implied that they used radio guidance as there was no jamming problem, this being a peaceful vehicle. He also stated that this was definitely timed to the Congress date and this was the first firing that they had attempted. It had originally been scheduled for 17 September but that it had slipped to 4 October for reasons not stated. He did state that they had a second satellite vehicle available as a backup that they would have used had the first one been unsuccessful. Someone questioned him about how they could have so much confidence in their first one being successful and he answered by saying that their people figured everything out very carefully theoretically and considered all factors. When asked about the extent of their computer effort in connection with the project he said that they had every thing in their heads. Don't know exactly what he meant by that as it is known that they have extensive computing facilities.

8. During the talk on Preparation for Visual Observation of Artificial Earth Satellites Madame Nasevich stated that their preparations started only last spring. She didn't make it clear whether these preparations included only the selection and training of the observing teams or whether it also included the development of their telescope. Their telescope is 6 power with 11 degree field of vision which she emphasized could be used for other astronautical work as well as tracking satellites. She stated that they expected to determine the position of their satellite to within 5 degree and the time to within 5 seconds at present. They expect the accuracy to improve considerably later.
Sixty-eight observing teams were established at 34 observatories and universities. About 30 observers are assigned to each team. They found that trained amateurs were working out very well, probably better than professional astronomers who were trained on automatic equipment. The leader of each team is, however, a recognized astronomer but the majority of the observing team working under him is composed of mature students. The teams are equipped with telescopes, tape recorders, radio, telegraph and stopwatches. The ephemeris is communicated by the Astronomical Council in charge of all observations to the stations in advance. During the observations, precise time signals are broadcast or telephoned to the stations. The observers send the signal by pressing a telegraph key as the satellite crosses the telescope reticles or passes a certain stellar configuration in the field. Both time and passage signals are registered on the tape recorder, the exact moment of the passage is determined later by a stopwatch and the position read from the stellar chart. It was stated that the stations situated in the zone of vision of the American satellite could also participate in the visual observation of it, provided the ephemeris was communicated to the stations in ample time. On the part of the Russians they were ready to communicate the ephemeris of their satellite to countries that will observe it. The data obtained from these observations is relayed to a common station by telephone. They provided training for their ground observer crews by using jet aircraft. One practice alert was conducted on 24 September and a second on 1 October. It was also stated that China had ordered some of their telescopes.

9. This particular Congress had much greater press representation than any other technical meeting I have ever attended. There were numerous European press representatives (reporters and photographers). From the U.S., Newsweek, Time, Life, Aviation Week and the N. Y. Times were represented that I know about, perhaps others. The USSR delegates were definitely the center of attraction. Starting with the initial reception on Sunday evening, 6 October, and continuing throughout the entire week, the press representatives were continually swarming around the Russian delegates. Photographers were continually snapping photos of the Russians as they sat in the audience and as they gathered outside the conference room during informal discussions. At the time that Madame Kurnosova made her presentation on the cosmic ray instrumentation seven photographers crowded around while she was putting formulae on the blackboard. A couple of times the chairman had to ask them to stop, particularly when noisy movie cameras were grinding. The reporters also talked to U.S. participants in an attempt to get their reaction which was quite varied. The range was from complete frenzy on the part of some in the need for an all out program of some sort to surpass the Russians and counteract the satellite publicity to a somewhat calmer attitude and one that tended to look at the long range program that could be possible.

One reporter made the comment that the Americans appeared to be more afraid of Washington than of Moscow.
10. The administrative arrangements and administrative procedure for conducting the meeting were very poor. The conference room was an outside room and of course not air conditioned; with the windows open it was too noisy and with the windows closed it of course got too hot and stuffy. At the opening session when delegates first reported in the Spanish administrative personnel were not yet prepared to issue the registration cards. During the meetings when the slides were shown, they never did have a screen, projecting directly on the wall. Most of the slides didn't fit properly into the obsolete projector. The slide operator invariably put them in wrong. The room lights could not be operated by the projectionist, necessitating a delay each time the lights had to be turned on or off. The projector cut off the corners of the slides. Insufficient copies of technical papers were available. The scheduled time for the papers was frequently changed without the audience knowing about it. They had no blackboard at first. The movie operator did not take the trouble to thread the film through prior to the showing and in general there was a lack of attention to detailed arrangements.

11. I was surprised to find that one of the papers given was titled "The Communications Satellite" by Mr. R. Haviland, General Electric Company, Missile and Ordnance Systems Department. I presumed that this work was being done with advanced nose cone funds as he said that he was working for Mr. Cotton although I did not understand how this could be justified. Considering the salaries of two or three people working with him along with possible computer time this might cost upwards of $100,000 per year. I brought this particular item to Colonel Dodge's attention who queried Mr. McFall about this on his recent visit to EWMD. Mr. McFall said that Mr. Haviland was doing the Communications Satellite work on his own.

12. Major George Colchagoff was present at the Congress representing Headquarters ARDC. His primary purpose in attending the Congress was apparently to determine if there were any on-the-shelf subsystem components available any place in Europe for EWMD system #6907L "Ballistic Weapons Research & Development Support System".

13. Some newspaper reporters made a brief survey of the reaction of the Spanish public to the launching of the Russian Satellite. They brought back the report that the general opinion was that the Russians not only beat us but they were nine times stronger. Apparently the ratio of the Russian Satellite weight to our IGY Satellite weight was being translated directly into a measure of military strength.

14. Prior to my trip and in anticipation of visiting the European office of ARDC I had the three Technical Divisions review the contracts and proposals of this office as obtained from their monthly activity report with the idea of determining the degree of interest in certain areas of research. This interest was broken down in three ways; first, interested in obtaining reports if the project was funded by another
organization, second, interested to the extent of supporting financially and third, interested in obtaining more information prior to deciding whether we were interested in reports or financial support. In addition to this, a list of projects was prepared by each Division of general areas in which unclassified research might be performed. I presented all of this material to Colonel Gossick, Commander, EOARD, and his staff. I found that a considerable amount of work had already been performed and a considerable number of reports had already been written on many areas in which we are interested. Their procedure for handling reports is to require one hundred copies of each report, four copies of which are retained by EOARD, one for permanent file the other three for loan in Europe. The other ninety-six are sent to the sponsoring agency. Most of these are of sufficient importance to also be made ASTIA documents. We have not been on the distribution list for even a listing of these reports but I saw that we did get on and I brought back a list of the reports which are already in existence. This is being reviewed now by Capt Albert who will take the necessary action to obtain one or two copies of these reports in which the Technical Divisions have previously expressed some interest in the project. Of the four projects in which the Technical Divisions expressed some possible interest in supporting financially three of these are already funded for another year and the remaining one probably will be funded. I brought back with me seven new proposals in areas in which the three Divisions had expressed an interest. These are being reviewed by the appropriate Divisions. I found that quite a bit of work is going on in Europe in Ionoospheric and Tropospheric propagation investigations, ionization, transition and atomic clocks. Apparently no work is underway on gravity anomalies. At the present time there is no immediate requirement for funds to be transferred to EOARD, however, there may be some requirement as a result of the proposals that are being reviewed. Therefore, the $75,000 presently programmed for support of this office should not be reprogrammed at the present time.

15. During my attendance at the Congress I formed many opinions as a result of personal contacts with the scientists and engineers of many countries who are working on astronomical problems. In order to emphasize the major conclusions I will state only those that I feel are of sufficient importance to warrant action.

a. LUNAR VEHICLE

(1) The Russians have an active development project for a lunar vehicle of some sort. There is no doubt in my own mind about this. With the propulsion and guidance capability for placing an 1,100 lb satellite on orbit, they certainly have the capability for placing a reasonable payload on the moon. The Russian literature, as documented by both RAND and ASTIA, indicates that they have been working on this for some time.
(2) From all of the newspaper and magazine articles that have appeared recently in connection with lunar flight possibilities and the emphasis, particularly in foreign newspapers, on the "Race to the Moon," it must appear to the general public of the world that the U.S. does have an active development project for a lunar vehicle. This impression has been generated by the numerous reports and papers that have been published as a result of the many technical feasibility studies that have been undertaken by individual organizations. These studies, however, have not been connected with an approved development project for a complete system.

(3) True, we do have the capability and the feasibility was recognized long ago but there has been no high level sanction for such a project. In fact, the reaction at top levels in Washington has been just the opposite. It is my understanding that committees such as the Tellier Committee that have been organized since the Sputnik launching to look into "what is wrong?" and "what can be done?" have steered clear of proposing anything that would interfere with our current programs. I am heartily in accord with this but I believe that we are obligated to inform higher governmental levels on just exactly what our capabilities are and what might be done without seriously jeopardizing our current programs. Industrial concerns and other governmental organizations have made feasibility studies and proposals involving various types of boosters but the most promising of these requires boosters of the size we are developing to put a reasonable payload on the moon. Therefore, we are the only organization that could attempt to schedule the development of such a vehicle.

(4) We presently have available Part II of the Advanced Weapon Systems Study which is a Pilot Study of Lunar Rockets. It covers feasibility for various types of trajectories and includes some very preliminary design sketches. I propose that we rapidly prepare a preliminary Development Plan indicating what could be done and when by diverting a few Series D Atlas missiles for this purpose. This Plan should then be presented in detail by a carefully selected briefing team not only to Hq ARDC and Hq USAF but to the DOD, the State Dept or the NSC or to whatever level is necessary to obtain a decision on whether to proceed or not. I feel that the top governmental levels should have a firm proposal from the organization capable of carrying it out. Then, if a negative decision is reached, the word should be
disseminated in such a fashion that the world at large will know that we are not in any "Race to the Moon". If this is not done, it will appear when the Russians accomplish such a mission that we have lost the race; a race we were never in. Even though an affirmative decision is made there is still a strong possibility that we will lose. In fact, there is a strong chance that the Russians may follow up immediately on their advantage and accomplish this even before a decision is made on whether we compete with them or not.

(5) To make my position clear, I am neither advocating that we have or not have a lunar project. All I am trying to say is that:

(a) We should make key echelons of governmental management cognizant of our capabilities and limitations so that a decision can be reached based on facts.

(b) If a negative decision is reached that the world be informed in an appropriate manner so as to forestall as much as possible further loss of national prestige.

b. MILITARY PARTICIPATION IN INTERNATIONAL TECHNICAL MEETINGS

(1) When military or civilian personnel of two or more of the military services actively participate in international technical meetings to the extent of presenting papers or acting as chairman of sessions, complete coordination should be performed beforehand in order that the best possible impression is left with the representations of other nations.

c. EUROPEAN OFFICE - ARDC

(1) I feel that this office is doing an extremely good job commensurate with their mission and available funds. They have already done much that is of interest to us and many of the reports that have already been published will benefit our program. I think that we could have benefited earlier had a personal contact been made sooner. I have now initiated action to take full advantage of what has already been done and this information will be available soon at no outlay of funds on our part.

2 Incls.
1. Program of LAF
2. List of Papers

CONFIDENTIAL

LAWRENCE D. ELY
Colonel, USAF
Director, Technical Division
Warren Systems
<table>
<thead>
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<th>TITLE</th>
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<td>Selencoid Satellites</td>
<td>W. B. Klemperer and E. T. Benedikt</td>
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<td>Attitude Control of a Satellite Vehicle - an Outline of the Problems</td>
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<td>Balloons Play Key Role in Upper Atmosphere Research with Rockets</td>
<td>Otto C. Winzen</td>
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<td>Meteor, Jr., a Preliminary Design Investigation of a Minimum Sized Rocket Vehicle of the Meteor Concept</td>
<td>Darrell C. Romick, Richard E. Knight and Samuel Black</td>
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<td>Recovery Techniques for Manned Earth Satellites</td>
<td>Norman V. Petersen</td>
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<td>Optimization Considerations for Orbital Payload Capabilities</td>
<td>H. H. Koelle</td>
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<td>Spaces of Potential Visibility of Artificial Satellites for the Unaided Eye</td>
<td>Ingeborg Schmidt, M. D.</td>
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<td>On the Generation of Temperatures to 30,000° K</td>
<td>Peter E. Glaser</td>
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<td>Sodium Emission at 140 km</td>
<td>E. R. Manning and J. F. Pedinger</td>
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<td>Applications of Satellorb (Satellite Simulating Observation and Research Balloon)</td>
<td>David G. Simons</td>
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<td>The Problem of Variable Thrust</td>
<td>W. N. Heat</td>
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<td>Research Goals in Astronautics</td>
<td>Colonel W. O. Davis</td>
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<td>Producing the Weightless State in Jet Aircraft</td>
<td>S. J. Gerathewohl, O. L. Ritter and H. D. Stallings, Jr.</td>
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<td>The Communication Satellite</td>
<td>R. P. Haviland</td>
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Design and Performance Data of Space Ships with Ionic Propulsion Systems
Ernst Stuhlinger

Recovery of a Circum-Lunar Instrument Carrier
Carl Gazley, Jr. and David J. Masson

Interplanetary Ballistic Missiles - A New Astrophysical Research Tool
S. F. Singer

Die Entwicklung der Rechtsbegriffe im Weltraumrecht
Andrew G. Haley

Optical and Visual Tracking of Artificial Satellites
Fred L. Whipple and J. Allen Hynek

Optimum Burning Program as Related to Aerodynamic Heating for a Missile Traversing the Earth's Atmosphere
Angelo Miele

Investigation of Cosmic Radiation by Means of an Artificial Earth Satellite
L. V. Kurnosova

The Nature of Cosmic Radio Emission and the Origin of Cosmic Rays
V. L. Ginzburg

Visual Observations of the Earth's Satellite in the USSR
A. G. Kasevich

Some Problems Relating to the Dynamics of the Flight to the Moon
V. A. Yegorov

Determining the Time of Existence of the Artificial Earth Satellite and Studying Secular Perturbations of its Orbit
D. E. Okhotsimsky, T. M Emiev and G. P. Taranyunova

Study of the Primary Cosmic Radiation by Using Artificial Satellites of the Earth
S. H. Vernov, V. L. Ginzburg, L. V. Kurnosova, L. A. Razorionov, N. I Fradkin

Essai de Contribution à l'autopropulsion nucléaire
J.-J. Barre

Pilotage d'un Astronef par des Moyens Radioélectriques
H. Gutton

Essai de Contribution à la Propulsion Ionique
J.-J. Barre
Tentative Demonstration of a Probable Connection Between Meteorological Disturbances on the Planet Mars and the Maxima of Solar Activity

Thomas Pedro Bum

The Displacement of the Solar System Throughout the Galaxy; Its Geological and Biological Influence in the Past and in the Future

Thomas Pedro Bum, C.E.

A Contribution to the Problem of Space Law Establishing a Technical and Practical Limit to Political Sovereignty in Height

Sociedade Interplanetaria Brasileira


Flavio Augusto Pereira and Thomas Pedro Bum

A Theory of Nightly and Hibernal Anabiosis of the Ultra-Xerophytic Flora and Possible Symbiotic Fauna on Mars

Flavio A. Pereira, S. D.

ITALY

Previsione Tempestate delle Caratteristiche del Moto di Mobili Aerobalistici nella Cibernetica Aeronautica

Associazione Italiana Razzi

C. E. Cremona

SWEDEN

The Weight of Minimum Cost Orbital Ferry Vehicles

Ejorn Bergqvist

GERMANY

Über Stabilitätsuntersuchungen an Flüssigkeitsgetriebenen Raketenmotoren mit Hilfe des Verfahrens der Harmonischen Balance

G. Heinrich and W. Peschka

Über die Strömung von Zylinderspaltströmungen

H. Bednarczyk
HOLLAND

On Relativistic Rocket Mechanics

J. M. J. Kooi

GREAT BRITAIN

The Probability of Intelligent Life Evolving on a Planet

Alan E. Slater
MEMORANDUM FOR COLONEL TERRY

OCT. 31 1957

SUBJECT: Informal Reaction of the "Stewart" Committee on Special
Capabilities to the 16 October Presentation on WS 117L

1. I was visited today by Mr. Robert Bunkheim of Rand, who as
you may know is a member of the subject committee. His purpose was
two-fold: to tell me of the reactions of this committee to our
presentation to them on WS 117L, and further to discuss what was
taking place in regard to the committee's actions in the near future
which might affect AFRMD.

2. Attached are some very brief remarks that he gave to me, as
not only informal but not the unanimous view of the committee.

3. While undoubtedly it can be claimed that WS 117L is a complex
system I have yet to have any of these helpful people tell us in any
way, shape or fashion just how we could go about reducing the complexity
of the proposed development and still meet the CCR under which we are
operating. I might also point out that this was the same Stewart
committee that advised the Navy on the approach that they should follow
on VANGUARD and it is not evident (to be charitable) that this was the
best way available to the Navy at that time to go about doing the job.

4. You will note from the attached a strong interest in the
exploitation of the IRBM as a booster for some sort of a satellite
vehicle. I understand further that the committee is scheduled to meet
again on or about the 14-16 November to consider this matter further
and that the Air Force has been asked to supply its views on this matter.
I am not aware, however, of any inquiry directed to AFRMD other than that
contained in AFRMD Telecom Number 48 with Col. Munnato as of yesterday
for any request for information on this subject. In preparation for a
possible request of this type I have asked Bunkheim to have Rand look
into the engineering feasibility of such a satellite plus military usefulness
of the exceedingly limited payload that this development would offer.
He has indicated to me that they were already at work on this and expected
to have some views available in anticipation of the forthcoming committee
meeting. I have also asked Cdr. Trux to study the problem since it
might well come up during my absence next week.

5. I have no information on what the AFRMD position is on such a
proposal but I would offer the following suggestions in the event that
this is considered at the appropriate level in the near future.

   a. While such a satellite could be built it would undoubtedly
take nearly as long as we think we require to build the WS 117L vehicle
particularly for a militarily useful payload. Even though one might
claim that the Thor or Jupiter could be available earlier than the Atlas
as a booster, there are a number of auxiliary problems particularly if
this is for a reconnaissance satellite version which would make the fore-
shortening of the development time either very costly, very costly, or both.
b. Our preliminary estimate is that at best we could expect to put a reasonable payload of about 300 pounds (including the weight of the space frame) on a 300 mile orbit or less with an ICBM booster. Because of the maximum velocity capable with an ICBM there is very little growth potential foreseeable in its use as a booster for a large military satellite, i.e., why put up another Sputnik one or more years later.

c. Were a vehicle based on THOR to be developed before we had the WS 117L vehicle flying we could undoubtedly use space aboard the smaller vehicle as a test bed for a number of the critical components of the WS 117L system. It would, however, have its greatest applicability as a carrier of scientific payload.

d. In view of the funds that would possibly be required for such development, i.e., greater than $100,000,000, I feel that such an effort could best be applied toward future generation systems of either the ballistic missile or satellite type rather than to put up a middle size satellite which would have the limitations described above.

5. If there is anything further that you wish WDTR to do in connection with the upcoming Stewart committee meeting on the grounds that we might be called upon, please let me or Truax know. I have suggested to Buckhaim that he suggest to the Committee Secretariat that the dates proposed (14-16 November) would be in serious conflict with commitments of the WS 117L project office should our presence be desired at this meeting.

Incl.  
1 page  
Unclassified

[Signature]

FREDERICK C. E. ODEN  
Colonel, USAF  
Director WS 117L
1. System described seems extremely complex.

2. Some skepticism about need for such complexity to satisfy the performance requirements indicated.

3. Apparent complexity seems to cast grave doubts on schedule.

4. Strong feeling that something useful can be done sooner with a simpler system.

5. Belief that pressing need exists for some capability prior to realization of system presently programmed.

6. Seems desirable to proceed in step-wise fashion, accepting limited objectives as valid ones to exploit best capabilities available at any given time.

7. Present item of major interest is IREM and how it can be put to use in military and/or scientific satellite program.

8. General belief that IREM can yield a useful military satellite capability.

9. Strong belief that IREM can be useful in providing satellite test bed for components of more ambitious systems like presently-conceived one.

10. Considerable objection to notion that use of IREM-developed satellite would constitute "dead-end" testing.

11. DOD has solicited, and will receive in mid-November, proposals from Army and Navy on military satellites.

12. Likely that at least one of these will proceed from IREM, and, as a minimum, the AF will have to have an organized stand on such a capability.

13. Further detailed discussion is desired on such things as: ground data processing, how resolution objectives were arrived at, choice of the Hustler engine, infra-red detection, need for secure data transmission system, etc.
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TO SGM DONOR AMC WEAPNS
COMM AF RMD INGLEWOOD CALIF
INFO COMM AF RMD INGLEWOOD CALIF
ET

/CONFIDENTIAL/ CTSI AEFPP 52291 Comb AMC PASS TO MCFFP FOR ACTION AND TO
MCER FOR INFO. THIS MSG IN 2 PARTS

PART 1. PROCUREMENT AUTHORIZATION NO 19-240-58 FOLLOWS CLN YOU ARE
AUTHORIZED TO ESTABLISH P-244 CATEGORY I CN 58-244-720A /GROUND HANDLING
EQUIP VS -117/ IN THE PROGRAM AMOUNT OF $2,400,000. THIS ACTION WILL
INCREASE THE P-244 CATEGORY I PROGRAMMED COST ESTIMATE IN THE AMOUNT
OF $240,000 FROM THE FORMER TOTAL OF $404,000,000 TO A NEW REVISED
TOTAL OF $428,000,000. THE FY 58 PROGRAM TOTAL FOR P-240 IS $430,676,900
IN CATEGORY I, AND $71,600,000 IN CATEGORY II.

PART 2. PROCUREMENT AUTHORIZATION NO 14-260-58 FOLLOWS CLN THE FY 58

PAGE TWO RJPWF 23F

PROGRAM TOTAL FOR P-260 IS $173,926,000 IN CATEGORY I. THE RESULTS FROM
CLN /A/ CATEGORY I CN 58-261-700 IS REDUCED FROM $32,800,000 TO
$30,400,000 /B/ IN AMOUNT OF $2,700,000 INCLUDED FOR DEFENSE MAIN
IS WITHDRAWN. /C/ OF THE AMOUNT OF $400,000 ESTABLISH FOR P-265, CATEGORY
I, $333,150 IS WITHDRAW ANCHORING FINAL DIRECTION P-265. THE DIFFERENCE
IS PROCUREMENT AUTHORIZATION NO 13. CATEGORY 2 TOTAL OF $23,800,000
REMAINS UNCHANGED. BUDGET HAS COORDINATED

BY THIS AC MSG
01/20427 NOV RJPWF

DOWNGRADED AT 12 YEAR
INTERVALS: NO. A.

DECLASSIFIED. DOD DIR 5200.10

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[Signature]
FOR IMMEDIATE RELEASE
4 November 1957

Subcommittee on Department of Defense Appropriations
Appropriations Committee
House of Representatives

Honorable George H. Mahon, Chairman of the Subcommittee has called a meeting of his Committee for November 20, in Washington D. C. for the purpose of exploring with Secretary of Defense McElroy, Deputy Secretary of Defense Quarles and others, the overall progress on the Ballistic Missile and Satellite programs of the Department of Defense.

In preparation for that meeting, some members of the Subcommittee are visiting the Air Force Ballistic Missile Division associated testing and production facilities on the West Coast for a first hand look at the status of the Air Force Ballistic Missile Program. This program includes the ICBM's ATLAS and TITAN and the IRBM THOR.

Five members of the 13 man Subcommittee now in Los Angeles are: George Mahon (D) Texas, Chairman of the Subcommittee; George Andrews (D) Alabama; Richard B. Wigglesworth, (R) Mass; Evrett P. Scrivner (R) Kansas; and Harold Ostertag (R) New York.

Today the Committee members have participated in a series of meetings with Major General B. A. Schriever, Commander of the Air Force Ballistic Missile Division (ARDC) in Inglewood, California and his staff. Honorable William M. Holaday, Special Assistant to the Secretary of Defense for Guided Missiles is also participating in the meetings.

Tuesday, November 5, the party will visit Convair at San
Diego to inspect the ATLAS intercontinental Ballistic Missile production and test facility. Wednesday, November 6, they will go to Sacramento for an inspection of Aerojet-General liquid rocket engine manufacturing and test areas and Douglas Aircraft Company THOR intermediate range ballistic missile and captive test site in Sacramento, California.

Additional installations, including the Army Missile Agency at Redstone Arsenal in Alabama will be visited on subsequent dates.

Mr. Mahon indicated that the Committee is reviewing the entire United States missile effort to determine the relative status of the programs and what if anything can be done to accelerate them. He does not want to comment on his conclusions as to how well the programs are progressing until he has completed his review.

END
ATTENDANCE LIST
HOUSE COMMITTEE ON APPROPRIATIONS
4 November 1957

Presentation Center
Col. Boatman, OIC

TOP-SECRET—NON-SECRET

Representative George H. Mahon
Representative Errett P. Scrivner
Representative George W. Andrews
Representative Harold Oerttag
Representative Bob Sikes
Representative Richard B. Wigglesworth
Mr. Samuel W. Crosby
Mr. Earl C. Silsby
Hon. William M. Holaday
Mr. A. G. Waggoner
Col. D. E. Williams
Mr. D. W. Patterson
Mr. Ralph Preston
Col. B. L. Baker
Lt. Col. R. A. Scurlock
Comdr Ernest W. Dobie, USN
Col. R. E. Coffin, USA
# PRESENTATION TIMING

## Morning

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<td>0910 - 0945</td>
<td>Introduction by General Schriever</td>
</tr>
<tr>
<td>0945 - 1000</td>
<td>Questions and discussion</td>
</tr>
<tr>
<td>1000 - 1035</td>
<td>Quarterly and special (107, 108, 109) films</td>
</tr>
<tr>
<td>1035 - 1100</td>
<td>Questions and discussion</td>
</tr>
<tr>
<td>1100 - 1125</td>
<td>Coffee break</td>
</tr>
<tr>
<td>1125 - 1205</td>
<td>Colonel Terhune (about 10 minutes interruption by questions)</td>
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<tr>
<td>1205 - 1235</td>
<td>Dr. Ramo</td>
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## Afternoon

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<tr>
<td>1350 - 1415</td>
<td>Dr. Dunn.(about 10 minutes interruption by questions)</td>
</tr>
<tr>
<td>1415 - 1450</td>
<td>Colonel Large (about 7 minutes interruption by questions)</td>
</tr>
<tr>
<td>1450 - 1520</td>
<td>Colonel Jacobson (about 4 minutes interruption by questions)</td>
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<tr>
<td>1500 - 1510</td>
<td>Dr Ramo re. &quot;Muttnik&quot;</td>
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<td>1510 - 1525</td>
<td>Facilities film</td>
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<td>1525 - 1535</td>
<td>Colonel Leonhard</td>
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<td>1535 - 1550</td>
<td>Coffee break</td>
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<tr>
<td>1550 - 1620</td>
<td>Commander Truax</td>
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<td>1620 - 1625</td>
<td>Questions and discussion</td>
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<td>1625 - 1630</td>
<td>General Funk</td>
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<td>1630 - 1645</td>
<td>Colonel Bishop</td>
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<tr>
<td>1645 - 1700</td>
<td>Colonel Shumsky</td>
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<tr>
<td>1700 - 1705</td>
<td>Questions and discussion</td>
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BRIEFING ON WS L7L TO THE AIR COUNCIL

5 Nov 1957
1. PURPOSE OF THE BRIEFING IS TO:
   a. Discuss the worth factors of the AF Advanced Reconnaissance System WS 117L in the light of intelligence requirements and the overall U.S. capability to fulfill these requirements.
   b. Review the technical features of the WS 117L, the planned developmental landmarks and the cost.

2. THE KEY DISCUSSION AREAS WILL INCLUDE:
   a. Need for Intelligence
   b. Intelligence Requirements
   c. State of knowledge and collection constraints
   d. Collection capability of WS 117L
   e. Comparison of collection systems
   f. Concept of WS 117L employment
   g. Review of technical program features
   h. Program costs
   so that the capability and worth of the WS 117L can be more easily and readily examined in relation to its cost and the demands of other projects.

3. Since the first three discussion areas have been covered by previous speakers, I will confine my discussion to establishing the role of the ARS in relation to these areas.
4. Measured against present intelligence requirements our store of knowledge is extremely inadequate and in general out-dated, although it is recognised that our recent special efforts have gone a long way towards making updating of some of this information.

5. It is well recognised that our Security Services through radio and electronic devices provide a great amount of vital data, some of which could not be gathered by any other means. Yet it is equally well recognised that photographic practice can increase our present knowledge of the Soviets:
   - more extensively
   - more accurately
   - more rapidly than any other means.

Photography has a unique advantage over practically all other kinds of intelligence in that it provides quite definite, credible, unambiguous information.

6. Briefly then let's quickly review the extent of our "photo take" today:

a. This represents the approximate photo coverage of the USSR accomplished by the German Luftwaffe in 1943–44. It extends through European Russia with incomplete coverage up to about the Urals Mountains. Until very recently and with minor exceptions this has formed the main basis of our information on air bases, the transportation system and Soviet industrial locations for our strategic targeting.
b. In the 1951-52 period we began the LLGP (Long-Range, Oblique Photography) operation, the use of long range cameras to accomplish oblique photography from along the periphery of USSR. This represents the areas of useful photo take possible with these operations.

c. The reconnaissance balloon project of 1956 produced approximately this coverage.

d. Recent special efforts still underway are believed to have generally covered the areas noted. Although this system is technically and operationally capable of covering considerably more, its operations have been stringently constrained by political countermeasures.

7. We can tentatively conclude from this brief review that:

a. Our needs far outweigh our present capability.

b. The nature of the intelligence problem requires:
(1) Very broad geographic coverage
(2) Very deep penetration
(3) Recurring looks at the same areas to detect change

This latter point is exemplified by such things as the length of time required to construct and conceal a missile launching site. The recycling time of our reconnaissance must not be too great.
8. Very closely associated with these conclusions are a number of formidable constraints which we have to recognize as limits or completely void our future aerial collection activity unless we design around them.

a. Weather is the chief limitation to photographic reconnaissance. Even during the most favorable seasons of the year in Russia, weather conditions will increase the over-flight sortie requirement probably by a factor of 4 or 5.

b. Geographic relationship between secure bases and the vast areas of Russia places long range problems on our reconnaissance systems similar to those of our striking force.

c. Enemy Air Defense System is forcing us to higher and higher altitudes.

d. Political invulnerability requirements for unauthorized overflight operations call for systems with:

1. Low probability of detection
2. Absolute minimum probability of being lost to enemy action
3. And ones which are not of such types and numbers as to easily be mistaken for the initiation of a IR attack.

Without a high degree to all of these features it has been proven that political countermeasures will be used to cause a halt to the operation.
9. Against this background of what intelligence we need, what intelligence coverage we now possess and the difficulties being imposed on our future conventional collection capabilities, let's examine the collection capabilities of the NS 117x.

a. We can generally state that post-war advances in the photographic and electronic arts have been such that the fully developed photographic reconnaissance satellite will produce information approximately equivalent in detail to average high altitude Ww II photography.

b. The worth of this reconnaissance system was first based upon qualitative approximations of the collected product.

c. Qualitative approximations have given way to:

1. Laboratory simulation
2. Paper analytical comparisons of Ww II capabilities with predicted satellite capabilities based on photo emulsion advances and the unique photo platform the satellite will make
3. Experimental checks through flight tests using high altitude balloons.

DISCUSS CHARTS --
THE DETAIL OBSERVABLE
THROUGH P. I. REPORTS
10. This quality is a result of improvements in both films and optics. Results have been carefully reviewed by such groups as the President's Science Advisory Committee and given their wholehearted endorsement as to over-all validity and feasibility.

11. Another attribute of the Advanced Reconnaissance System which should be brought to your attention is the quantity of reconnaissance data produced by this system. To collect reconnaissance data, the satellite will be flown on an orbit inclined 83° with the equator at an altitude of 300 statute miles. The orbit will be retrograde in that it will move contrary to the direction of the earth's rotation. The retrogression rate of this orbit is such that the satellite will operate with the sun in the orbital plane over the Sino-Soviet Bloc at approximately the same time of day (noon) during all seasons of the year.

12. With the search type 6" focal length vertically fixed camera system the satellite on such an orbit will cover a swath on the ground 100 miles wide. This will affect complete photographic coverage (ignoring cloud cover, precipitation, etc.) of the USSR and its satellites in a 15 day period which will include considerable overlapping side cover.
The initial power supply limitation of 30 days useful life will therefore provide coverage of the nine-Soviet Bloc two separate times per vehicle, each cycle providing considerably duplicate cover.

Expressed in more tangible terms each satellite search vehicle will have the capability of photographing 36,000,000 square miles within a month or 1,200,000 square miles/day.

The weather conditions of the area of interest is such that with four (4) times coverage (60 days operation) there is a 90% probability of getting a complete "photo map" of all of USSR and its satellites.

The higher-resolution photographic system which utilizes a 36-inch focal length camera which can be directed at pre-selected targets occurring within approximately 150 miles of the orbit path. The capacity of the system will permit the specific surveillance of a finite number of targets anywhere within the USSR and Communist Bloc territory once every five (5) days. Based on an average target area of 17 x 17 miles this system can cover 120 such site targets per day or any other appropriate combination of the above.

The total target area coverage possible per vehicle is 1,000,000 square miles for a 30 day life vehicle.

When weather factors are taken into account there is a 90-95% probability of covering any number of selected
targets within the 30 day period. (This would afford a 6x look/target).

Another way of looking at the quantitative performance of the ABS is by comparing it with the number of sorties required by specially developed manned systems to obtain this same coverage. It has been estimated that 200-225 successful overflight search sorties will be required to provide one time complete small scale photo cover of the USSR and Communist Bloc (disregarding weather). When weather factors are considered this estimate will conservatively increase by a factor of 4.

For the same probability of achieving usable search type photography of the area (average of 6x coverage to minimize weather factors),
a. 300-500 individual penetrations by special aircraft will be required.
b. Compared to 60 days of satellite operation (2-30 day life satellites).

It can be seen that a considerable force would be involved to duplicate the timeliness of the cover and that the number of penetrations required to achieve just one-time coverage of the entire area places a very low confidence figure on the assurance of completing the job before political countermeasures are effective in turning off the operation. Certainly it is inconceivable
to believe regardless of how much desired that a continuous overflight program of the scope required to provide timely, repetitive cover of the $9 \times 10^5$ miles can be conducted by employing special aircraft systems alone.

**CHART FIG 25.** Now that the qualitative and quantitative worth of the AS has been established, let us turn to a comparison of the effectiveness of various future reconnaissance systems as a function of time. Balloon borne devices will lose effectiveness because of increasing Soviet countermeasures capability LOROP (Long Range Oblique Photography) will continue to have about the same effectiveness. For a while penetration flights will be valid but will suffer a drop in effectiveness as they tend to be overtaken by
Soviet Air Defense capability. They may increase with introduction of new techniques such as boost-glide devices. The ARS will be far less susceptible to Soviet air defenses and, if its purpose and capability is properly protected, will not be subject to political countermeasures since the Soviets themselves have stated their intentions of launching satellites on high latitude orbits.

Here is a qualitative comparison of the reconnaissance system effectiveness with time - based on their ability to satisfy the constraints discussed - mainly air defense and political invulnerability.

Next, let's compare these systems against some criteria relating to the intelligence needs and the constraints imposed.

From all this it is concluded that:

a. Intelligence requirements are increasing from a point of view of total cover, timeliness, and repetitive looks.

b. Collection capabilities of conventional systems are decreasing.

c. WR 117L will overcome the major constraints that limit other systems.

d. WR 117L System can satisfy a large portion of the critical intelligence needs.
e. The US 117L should not be considered a completely independent system. Other complimentary higher resolution collection systems are definitely required. The efficiency of these other overflight systems can be greatly increased by the use of the US 117L in a programming role, thereby decreasing overall risk and improving political acceptability of required minimum number of overflights.

Now let us briefly review the technical program of US 117L. The Advanced Reconnaissance System program is not a new concept. The RAND Corporation was organized in 1945 to study the feasibility and utility of a satellite vehicle. Their studies and conclusions, which were accepted by the Air Force, led to the initiation of development of subsystems and components critical to a reconnaissance satellite as early as 1951. These were organized into Project 1115 in 1954. In 1955 responsibility for the ARS was transferred to NED (now AFREO). A development plan for US 117L was submitted and approved last year (1956) and a systems development contract let with the Lockheed Missile Systems Division (chosen after a considerable design study competition).

The reason for assigning the ARS project to AFREO was due to the fact that the satellite requires a booster.
similar to an ICBM (less nosecone). The contributions of the ICBM program to the development of a large satellite go beyond the provision of a booster. The satellite designed for the Advanced Reconnaissance System is essentially a powered "nosecone" fitted on the body of an SM-65 by an adapter flange. The gross fueled weight of the satellite plus adapter is 9300 lbs. This device places a useful payload of nearly one ton on a precise orbit 300 miles above the surface of the earth. It is powered by the XLR-91 rocket engines which use JP-4 fuel and H2O2 oxidizer.

The XLR-91 engine was developed by Bell Aircraft Company to power the pad for the Hustler. Prior to cancellation of the Hustler pad program the XLR-91 completed nearly all of its Preliminary Flight Rating Tests.

This is the "Space Utilization Mockup" of the ABSS vehicle built by Lockheed shown with the adapter section pulled back. The vehicle is 21 feet long and 5 feet in diameter.

The payload of the photo-reconnaissance satellite consists of the visual subsystem, attitude stabilization equipment, auxiliary power, and the vehicle portion of the ground-space communications subsystem.

A prototype camera and film drive have been built and are undergoing tests by Eastman Kodak, as is the film
The film read-out equipment is undergoing breadboard tests by C&6 Laboratories. The pictures you saw earlier were actually "read-out" with this breadboard equipment.

Major sub-assemblies of the attitude stabilisation equipment are undergoing preliminary testing at the MIT Instrumentation Laboratory.

Our present test schedule envisages a first test from ANAS in May 1959. This will not be an orbiting flight but will test such items as satellite engine start, separation, vehicle erection, etc. Orbital flights begin with Flight 5 and the first visual reconnaissance flight is scheduled as Flight 10 on a low latitude path.

In order to meet the DCI for WS 117L a funding program such as is shown would be needed. This is that contained in the System Development Plan. Note that funding deficiencies for such a program began in FY 57. Note that by the program our first test flight was in 1958.

Because of funding shortages in FY 57, ANAS submitted in January 1957 a financial plan and budget estimate as shown. The schedules show a slip from the previous one by approximately 6 months.

In order that we not slip the program way out of context with its need, this is a minimum program for WS 117L. Note
that the first launch date has slipped one year from that of the development plan schedule.

31. CONCLUSION: You have been shown the worth factors of the ARS in light of intelligence requirements and the over-all capability of the USAF to fulfill these requirements. The system is badly needed and is feasible. Program costs are not exorbitant and represent a minimum cost program consistent with military need and the technical problem involved.
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COPY

MFA004
RR RJWPJF
DE RJWPJF 14P
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PM HEDUSAP WASHDC
TO ZER/CONSAC WEBB OHI
INFO RJWPJF/CONSAC MD HQ ARDC INGLEWOOD CALIF
BT
/CONFIDENTIAL/CITR ARAPP 52392. CONSAC FOR MGFP. ARAPP
MSG 516689 18 OCT 57 LIMITING OBLIGATION AND COMMITMENT AUTHORITY
TO $15.9 MILLION THRU JAN 1958 ON EA 58-95 /ARS W5117-1/ IS HEREBY
RESCINDED.

BT
THIS "AC" MSG
06/0045Z NOV RJWPJF

DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD Dir 5200.10
MEMORANDUM FOR RECORD

SUBJECT: THOR Space Flight Capability

1. On 2 November a request was received from Headquarters, USAF, for AVBD's assistance in preparing a presentation to the Armed Forces Policy Council concerning USAF capabilities and plans for space flight testing. A meeting was held at AVBD on 3 November to prepare a joint AVBD/AC/John DAC position on the capabilities of THOR for this mission. Present at this meeting were the following:

AVBD -
   Colonel Barham
   Lt Colonel Jacobson
   Lt Colonel Hale
   Lt Colonel Greese

R/V -
   Dr. Mattler
   Mr. Donovan

DAC -
   Bob Johnston
   Jack Bresnang

2. This group reviewed the findings of the "Barlow" sub-committee of the "Teller" Ad HOC Committee and agreed to the proposal made by DAC that the use of the Vanguard third stage plus THOR could realize the earliest practical capability for a large satellite or for a moon rocket.

3. Briefly, the performance capability of THOR plus a single Vanguard third stage, solid rocket could place 150 pounds on orbit at an altitude averaging 300 nautical miles. AC Guidance would not be required if orbit eccentricity would be acceptable. This configuration was labeled as Case I. Case II called for THOR, plus a second stage consisting of four Vanguard third stage rockets and a third stage consisting of a single third stage Vanguard. This configuration could place 600 pounds on a 300 mile orbit or 50 pounds in the vicinity of the moon.

4. Case III had the same configuration as Case II except that more sophisticated experiments had been considered. There was also a possibility that a single rocket such as a one-fourth length Aerojet, 40 inch solid rocket could replace the cluster of 4 Vanguard third stages.
5. The following schedules were agreed as being feasible and also not seriously damaging to the THOR program.

a. Missiles 114, 115, and 116 could be used for Case I and Case II experiments. The Case I experiment could be conducted by 1 March and Case II experiments could be conducted by 1 May, 1956.

b. If Douglas would be authorized to increase their production, as many as six additional missiles could be made available for space flight testing between July and December 1956.

This schedule hinged completely upon immediate availability of the technical details of the Vanguard Third stage and upon the early receipt of the Vanguard Third stage rocket and spin table hardware.

6. On 4 November, at the Pentagon, I assisted in preparation of the Air Force presentation to the Armed Forces Policy Council. A transcript of this presentation which was made by Major General Mills, Headquarters, USAF/AFMD has been previously furnished through channels to Major General Schriever. The contents of this presentation were thoroughly reviewed and agreed to by the Assistant Secretary of the Air Force, Mr. Harmer. After the presentation to the Armed Forces Policy Council, General White requested Major General Mills to rewrite the same presentation to the Commander's Conference during the afternoon of 5 November. Later in the day I was advised by AFMD that a directive to proceed on THOR Space Flight Testing will be forthcoming. After being queried, I advised that we would be prepared to deliver a complete presentation after 16 November.

7. Since the Navy had made similar recommendations to the Armed Forces Policy Council concerning the use of THOR and of the Vanguard Third stages, our plans to visit NEL on 6 November were deemed inappropriate by Brigadier General McCorkle (ANCCM) and Mr. Harmer. Arrangements for future meetings will be made after major policy issues are clarified.

SIDNEY GREENE
Lt. Colonel, USAF

SIDNEY GREENE, Lt Col, USAF
US-515A Missiles Development Division

[Signature]

[Handwritten note: Signed by J.S. Miller]
Subject: Outer Space Vehicle

1. The Air Force briefed the Armed Forces Policy Council on 5 November 1957 on Reconnaissance Satellite Program (WS-117L) and possible combinations or vehicles that would be used for cold war and scientific programs.

2. The present Air Force program for WS-117L provides for a first orbital reconnaissance capability in June 1960. To accelerate this program to June 1959 requires additional funds of $2 million in FY 58 and $26 million in FY 59.

3. Of the large number of possible combinations that were presented to the Armed Forces Policy Council as cold war and scientific programs which could be considered as a follow-up for Project VANGUARD, the Air Force recommends that the Thor Booster be used and that this program be immediately approved which would provide a satellite on orbit in March 1958. In addition, it is recommended that immediate approval be given for the production of six additional Thor Boosters for this program. The cost of this complete program would be $12 million dollars.

RECOMMENDATION:

4. That the attached memorandum to the Secretary of Defense be signed and dispatched.

Ralph J. Nunziato
Colonel, USAF
Assistant for Special Projects
Deputy Chief of Staff, Development
MEMORANDUM FOR SECRETARY OF DEFENSE
ATTENTION: SPECIAL ASSISTANT
ARmed FORCES POLICY COUNCIL

12 November 1957

SUBJECT: Outer Space Vehicle

Reference is made to your memorandum of 6 November 1957, subject as above.

The Air Force Advanced Reconnaissance System (WS-117L) that was presented to the Air Force Policy Council on 5 November 1957 can be accelerated which will provide a first orbital vehicle having a limited reconnaissance capability in June 1959 instead of the presently programmed first orbital date of June 1960. The additional funds required for this accelerated program are 5.2 million in FY 58 and 28 million in FY 59. These funds are required for long lead time items.

There are a large number of combinations of vehicles that can be married together to provide a reconnaissance satellite or cold war and scientific programs which can be considered as a follow up on Project VANGUARD, and to provide important development test vehicles leading to larger reconnaissance and scientific satellites. The Air Force recommends using as the basic booster the Thor, which incorporates the AG Spark Plug Inertial Guidance System since a limited number of Thor boosters could be made available. In fact, three-Thor missiles numbers 114, 116 and 118 could be made available in a relatively short period of time with minimum interference to the IRBM program which would provide a satellite on orbit in March 1958. This is with the understanding that other existing hardware would be made available. Missiles 116 and 118 could be used for either a satellite or a recoverable animal satellite prior to 1 July 1958. An additional six Thor boosters which could be made available from the planned production schedule would be necessary to insure success. The cost of this program would be 12 million dollars, but it is essential that an immediate go-ahead be given if the schedules mentioned above are to be maintained. More detailed information is attached. (Chart 1)

The specific proposal for utilizing Thor to provide a photographic reconnaissance capability using a recoverable satellite has been studied...
and looks feasible. This system would utilize Thor as a first stage, the Lockheed re-entry vehicle as a second stage, and two Recruit Motors as a third stage. This system would provide a payload of 300 pounds on a 150 mile orbit. It would have the capability of photographing over a million square miles in two days of operation. This system would require 18 to 24 months to be operational and would cost approximately 20 million dollars. The funds required would be for the camera, altitude control system, and the necessary components to fire the recoverable capsules back to earth. The cost mentioned above would be on a basis that the boosters would be provided as government furnished equipment.

The Air Force has also studied the use of seven NAVAHO Boosters that have already been assembled. There are an additional five NAVAHO Boosters in various stages of completion. To complete these five additional boosters would cost approximately $500,000. A special program utilizing the NAVAHO Booster as a first stage and various second, third, and fourth stages would cost from 5 to 10 million dollars, depending on the stages and mission to be accomplished. Satellite payload could vary from 75 to 2,000 pounds and payload to the moon can vary from 25 to 270 pounds. These programs could be operational in 8 to 12 months again depending on the mission to be accomplished.

The Air Force Advanced Reconnaissance System (Weapon System 117L) utilizes the Atlas Booster. The operational date of WS 117L of June 1959 is based on the availability of the Atlas Booster with minimum interference to the ICBM program. Any other uses of the Atlas Booster would interfere with the ICBM program or WS 117L unless production rates of the Booster were increased.

The Titan Booster will provide a substantial increase in performance and permit reasonably large satellites at very high altitudes, i.e., 22,000 miles. There are studies underway, at the present time, that will provide us with sufficient data to answer your questions. As soon as the studies are completed the data will be made available.

The Air Force recommends that an immediate go-ahead be given to proceed with the program outlined in paragraph 3.

/s/ RICHARD E. HORNER
Assistant Secretary of the Air Force
R&D
### THOR SPACE FLIGHT TESTING

- ACSAP INERTIAL SYSTEM ABOARD (FLIGHTS MEET GUIDANCE PROGRAM OBJECTIVES)
- CURRENT WS-318 A/AFHIC FACILITIES AND PERSONNEL WILL BE USED

<table>
<thead>
<tr>
<th>CASE I</th>
<th>MISSION</th>
<th>TIME</th>
<th>MISSILES</th>
</tr>
</thead>
<tbody>
<tr>
<td>THOR + 1 VANGUARD 3RD STAGE</td>
<td>160 LB ON 300 MI ORBIT</td>
<td>PRIOR TO 1 MARCH, 1958</td>
<td>114 (AT AFWTC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CASE II</td>
<td>MISSION</td>
<td>TIME</td>
<td>MISSILES</td>
</tr>
<tr>
<td>THOR + 4 VANGUARD 2ND STAGE MOTORS + 1 VANGUARD 3RD STAGE</td>
<td>600 LB ON 300 MI ORBIT OR 50 LB AUGMENT</td>
<td>PRIOR TO 1 MAY, 1958</td>
<td>116 (DELIVERY 12 DEC.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASE III</td>
<td>MISSION</td>
<td>TIME</td>
<td>MISSILES</td>
</tr>
<tr>
<td>TH02 + EAGLE AS CASE II OR BETTER</td>
<td>600+ LB ON 300 MI ORBIT OR 60+ LB AUGMENT (INSTRUMENT RECOVERED)</td>
<td>JULY TO DECEMBER 1958</td>
<td>3 TO 6 ADDITIONAL MISSILES</td>
</tr>
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- SPIN TABLE USED TO STABILIZE SOLID STAGES

CONFIDENTIAL
13 NOV 1957

WITH

SUBJECT: Priority of Systems Developments

TO: Commander
Air Research and Development Command
ATTN: RD20
P.O. Box 1393
Baltimore 3, Maryland

1. Reference Eq ARDC Programming Note No. 58-6, dated 19 September 1957.

2. The Integrated Priority Listing of Systems Developments contained in the referenced programming note places WS-117L at position sixteen. This priority listing is inconsistent with recent Department of Defense decisions to pursue the WS 117L Program on a maximum effort basis.

3. It is requested that necessary action be taken to establish WS 117L in a position number three, immediately following the THBN, on the Integrated Priority Listing. This increase in priority is imperative to permit command of funds, manpower, and expeditious actions necessary to conduct the WS 117L Program on a maximum effort basis. The increase in priority is a necessary corollary to action already initiated by Eq ARDC, namely, to place WS 117L in the number four position on the Master Urgency List.

SIGNED

O. J. RITLAND
Brig. Gen., USAF
Vt: r

Major Zelenka 2595
THIS IS THE MSG WHICH LT COL. VORTMAN PROMISED TO SEND YESTERDAY.

THIS IS 84-2214.
CONFIDENTIAL

PAGE THREE DHEW OS

CHIEF PROGRAM FUNDING DIVISION OFFICE ASST FOR DEVELOPMENT

PROGRAMMING, DCE/DEVELOPMENT UNQUOTE REQUEST YOUR DIVISION TAKE

ACTION TO COMPLY IN ACCORDANCE WITH PREVIOUS CONVERSATIONS BETWEEN

GEN PUTT AND GEN SHIVER AND WITH USAF PRESENTATION TO ARMED FORCES

POLICY COUNCIL. CITED FUNDS WILL BE MADE AVAILABLE TO YOUR DIVISION.

AS STATED: RECOMMENDATIONS WILL BE MADE TO THIS NO. IF FURTHER CLARIFICATION

IS REQUIRED, CONTACT THIS NO. THROUGH BDZU.

BY

13/10/72

CONFIDENTIAL

ICCC LINE 7 SIX

RESULTING RECOMMENDATIONS WILL BE MADE AVAILABLE TO YOUR OFFICE.

RESULTING RECOMMENDATIONS WILL BE MADE TO THIS NO. IF FURTHER

CLARIFICATION IS REQUIRED,

CFF

Secretary

CONFIDENTIAL
CONFIDENTIAL

IS MR GERGASON THERE LT VOL WORTMAN HERE

MIN CHECK
GERGASON/GERGASON

CAN U STILL READ ME CA

AND SET ME 28 PLS

AND NOW NOW CA PLS

MR GERGASON IS NOT IN AT THE MOMENT
BUT MRS TIERNEY THE SUPERVISOR IS HERE WILL SHE X XXX CAN SHE FILL
IN FOR MR GERGASON CA

YES

FOR MRS TIERNEY FELL I

I THIS IS A SENSITIVE MESSAGE, PLEASE DELIVER IT ONLY TO
GENERAL RITLAND OR COLONEL HAMILTON. THANK YOUR

PLS ACK

THIS IS MRS TIERNEY HERE
HAMILTON FOR U

PP RJTNF
RE RJNPF/CSI
P 00120503

TO COMDE ARDC/SFZCW LT COL WORTMAN/
TO COMDE AFNDF/GENERAL RITLAND/

CONFIDENTIAL

THE INTELLIGENCE CUBE 03-049.

PART ONE. ON 17 NOVEMBER GENERAL SCHRIEVER MET WITH GENERAL ANDERSON
GENERAL GROTHANER, COLONEL KIELLING, AND I WERE ALSO PRESENT FROM
1200 TO 1330 TO DISCUSS RECENT THOR-JUPITER DEVELOPMENTS AND PUBLIC
INFORMATION PROBLEMS. DURING THE LAST TWENTY MINUTES OF THE CONFERENCE,
A SCHRIEVER DEVELOPED A CASE FOR GIVING THE AFNDF CONTROL OF ALL
PRESENT AND FUTURE TECHNICAL DEVELOPMENT WORK WHICH IS CLEARLY ORIENTED
TOWARD THE SUPPORT OF BALLISTIC-OR SPACE WEAPON SYSTEMS. GENERAL
ANDERSON STATED THAT AS OF THAT MORNING HE HAD SIGNED A DIRECTIVE TO
GENERAL DAVIS MAKING HIM RESPONSIBLE, AS AN INDIVIDUAL, REPEAT

CONFIDENTIAL

MOSSAT-57-831
SECRET

CONFIDENTIAL

GENERAL OSTRANDER THEN STATED THAT HE WAS PERSUADING ANOTHER SOLUTION WHICH PLACES THE FOCUS HERE IN THE ISSUE. IT IS TIME FOR THE DEPUTY COMMANDER OF SPACE WEAPONS, RESPONSIBLE FOR BOTH SPACE WEAPON SYSTEMS AND THE TACTICAL DEVELOPMENT SECTION OF GENERAL SCHELIER TO BE THE OPERATIONAL SYSTEMS MANAGER. HE REMINDS HIS TECHNICAL DEVELOPMENT REQUIREMENTS TO DO WITH GENERAL SCHELIER, COMPLEMENTS, AND I CONSENTED UNCONDITIONALLY TO THE PROPOSAL. NOT GENERAL OSTRANDER FEELINGS WERE CONCERNED. GENERAL CARPENTER SAID BOTH PROPOSALS WOULD BE PRESENTED TO GENERAL ANDERSON FOR A REACTION BEFORE 22 OCTOBER.

THE SUBSEQUENT MEETING OF GENERAL ANDERSON UNSETTLED FEELINGS IN THE ISSUE. IT IS NOT AT ALL CLEAR WHICH PROPOSAL WE WOULD APPROVE. I AGAIN RECOMMENDED AN ATTEMPT AT /A/ A DELAYING ACTION REGARDING THE PASS OF THIS RECEPTION, AND /B/ HEAVY CALIBER APBND REPRESENTATION. THROUGH A DECISION MEETING, GENERAL ANDERSON IS ON DUTY WITH A GROUP BY THE END OF THIS WEEK AND CAN BE REACHED THROUGH A CALL AT THE WASHINGTON GARDEN OFFICE, OR THROUGH ATTAC.

I BELIEVE THE APBND WOULD HAVE MUCH TO GAIN BY SENDING A TEK-DEC TO THE SAME "PERSONAL ITEMS THAT GENERAL SCHELIER TO GENERAL ANDERSON" EXPRESSED GENERAL SCHELIER DESIRE THAT HE COULD NOT STAY UNTIL THE END OF

CONFIDENTIAL
SUBJECT: Study of Titan for Space Flight Testing

1. A presentation was made at AF 34 on 21 November by the Douglas AC, which summarized progress to date on a study currently being performed as a result of authorization by HQ USAF to AC 11 to conduct a 30-45 day engineering study of the feasibility of using Titan for space flight testing. The following performance capabilities have been agreed upon by NASA, A-7, and AC 11.

Case I. An early Titan carrying full instrumentation as well as an AC guidance system can place a 50-100 lb. satellite on an earth orbit at an altitude averaging 300 miles. This proposal uses a Vanguard solid rocket for a second stage. These calculations were based on 25% efficiency. Angular accuracy requirements are approximately 3°, and they can be fulfilled through the use of an autopilot alone. There appear to be no problems that would prevent an early satellite launch; however, the following factors require further investigation:

   a. Missile stabilization
   b. Guidance accuracy using autopilot alone
   c. Characteristics of the Vanguard solid rocket to maintain spin velocities of 100-200 rpm
   d. The uncertainties in ignition delays of the Vanguard rocket

Case II. The additional stages to Titan consisting of a cluster of four Vanguard solid rockets and a single Vanguard solid rocket can place approximately 30 lbs. on a flight to the moon. Stabilization of the 2nd and 3rd stages will be accomplished by spinning, prior to their separation from the Titan booster. Allowing for all known factors, and using the AC guidance system, it was established that the probability of striking the moon is 25-30%. In case of a miss, an artificial asteroid would be created. Anticipated problems are:

   a. Missile stabilization
   b. Guidance accuracies
   c. Ignition delays
   d. Forces experienced by the spinning rockets
2. Present plans call for LIA to present an informal final report on 10 December. AFRICL plans to submit the complete study with costing data on/about 15 December.

3. Of immediate importance is obtaining at least 5 Vanguard 3rd stage engine casings, a Vanguard spintable, and two dozen spin rockets.

Cym furn:
Lt. Col. Horton
Dr. Leitner
Dr. Tidial
Kurt Ratt

SIDNEY CAHENS
Lt Colonel, USAF
Weapon Systems 315A
MEMORANDUM FOR COLONEL TERRUM

NOV 26 1957


1. The WS 107A-1 - XSM-65 missile, minus nose cone and adapter, will be mated with the WS 117L orbiting vehicle to boost said vehicle into a pre-arranged boost condition in space, prior to orbital injection.

2. Examination of the WS 117L Flight Schedule indicates that immediate action must be initiated on the part of the WS 107A-1 and WS 117L program offices and associated contractors, to assure the development of an integrated launch operation capability by June 1959 at ARMTC.

3. The following basic plan represents the method by WDTC (WS 107A-1) and WDTR (WS 117L), under joint agreement, will accomplish flight testing for WS 117L at ARMTC. The "plan" pointedly stresses a minimum compromise of the WS 107A-1 objectives, but also a maximum attempt at achieving WS 117L objectives within the limits of whatsoever restrictions may be imposed by the higher priority of WS 107A-1. No serious compromise of WS 117L objectives is anticipated considering the integration circumstances; namely during the RAD test period of the higher priority WS 107A-1. Present planning is predicated on subsequent WS 117L-Cooke operations beginning early in 1960 on a launcher built expressly for WS 117L in the 65-1 complex.


   a. All elements of the WS 107A-1 program required for WS 117L testing, whether production items, productive or support services, or management and direction functions, will be GPE to IMSD as prescribed by a production and flight test schedule which will be devised jointly by WDTC and WDTR.

   b. The WS 107A-1 Program offices will procure the "elements required" described in (a) above. This will be accomplished by supplemental agreements to existing contracts, with those contractors who will be involved in WS 117L operations by virtue of hardware, services, or technical direction responsibilities in the WS 107A-1 program. All identifiable items will be funded by WS 117L on a reimbursement basis to WS 107A-1.

   c. The identical organizational structure, which presently implements the WS 107A-1 program, will be maintained in WS 117L support functions, however, the delegated responsibility of the WS 107A-1 organization will only involve the XSM-65 and its specific operation and contributory support to the over-all WS 117L operation. IMSD will
be responsible for over-all conduct of WS 117L flight tests, and thus act as WS 117L Test Conductor at AFMTC; under the direction of the AFBMD, WS 117L Test Conductor (who serves as chairman of the Flight Test Working Group). IMSD will publish the WS 117L Detailed Test Objectives; subsequent to coordination with AFBMD and R-W on those items that concern the XSM-65, its support and operation.

d. WS 117L flight testing will begin at AFMTC in June, 1959 at approximately a one-per-month-and-a-half rate for approximately six months. A continued WS 117L AFMTC Test Program, of low inclination orbit flights, is planned for future RAD; a firing rate of one every three or less months is anticipated for this program, which will commence whenever WS 107A-1 facilities again become available for WS 117L use.

e. Since the AFMTC-WS 117L operations will serve to educate IMSD and AFBMD in the procedures and problems associated with utilizing the XSM-65 for WS 117L purposes, the subsequent Cooke WS 117L operations will be again directed by IMSD under AFBMD supervision. The type and supervision of XSM-65 launching and handling crews at Cooke AFB, which will support WS 117L, is not considered here.

5. The inclosed charts illustrate, in general, the functions and responsibilities involved in implementing the above described "plan" for AFMTC. Again, all WS 107A-1 program elements, contributing to the support of WS 117L operations at AFMTC, will be achieved under the same organizational structure as presently exists in the WS 107A-1 program.

6. IMSD has prepared an itemized list of work that is, in view the WS 117L Test Schedule, required immediately of WS 107A-1 contractors. IMSD sorely needs XSM-65 hardware and operations data for planning the forthcoming integration, but cannot proceed without established contractual relationships.

7. The "plan for AFMTC", described above, reflects essentially a "modus operandi" approved by Colonel Michel, AFBMD Field Office at AFMTC, based on previous conversations with Lt. Colonel Morgan and Captain Roy of that office. However, the actual "plan", as worded above has not been coordinated with Colonel Michel as yet, but will shortly reflect his recommendations on the subject.

4 Incls: (UMCL)
1. Organ for WS 117L
   Operations at AFMTC
   Colonel, USAF
   Director, WS 117L
2. WS 117L Data Handling
   Process AFMTC Operations
3. Establishment Procedure for
   Detailed Test Objectives
4. WS 107A-1 Flight Test Working
   Group

FREDERICK C. E. ODER

WDTC 57-411

CONFIDENTIAL
Organization for WS-117L Operations at AFMTC

During Countdown:
- Lines AB & CD apply before
- Lines AB' & CD' apply after

Service Structure Removal
Organization for W3117L Flight Test Planning at AFMTC
FLIGHT TEST WORKING GROUP

Purpose: Draft "FLIGHT TEST DIRECTIVES" based on "DETAILED TEST OBJECTIVES", and, FINALIZE "COUNTDOWN PROCEDURES"
27 November 1957

SUBJECT: Overtime Policy - 117L Program

TO: Department of the Air Force
    Chief of Staff, Eq USAF
    ATTN: AFGM
    Washington 25, D. C.

1. At the present time, the 117L Program is governed by the overtime restrictions as defined in Air Force Procurement Circular 120 dated 8 October 1957, which limits overtime on Air Force Programs other than Ballistic Missiles to two percent of programmed manhours.

2. The Advanced Reconnaissance System (117L) described in the development plan, was designed to fulfill the military requirements outlined in GCR #60 (SA-2c), 16 March 1955, ARDC SR #5, 17 October 1955, USAF DD #85, 3 August 1956 and ARDC SDD #117L, 17 August 1956. The system will provide a surveillance capability which will be global in scope. Such a system is a natural companion of the Ballistic Missile program. Not only will its employment serve to reveal any preparation for attack well in advance of the event, but in addition, it will provide a means of obtaining accurate up-to-date target information. Bomb damage assessment and other current target information is an essential ingredient in the effective deployment of any strategic weapon.

3. The inter-relationship between the two programs indicates that timely development and production is as important in the 117L Program, as it is in the Ballistic Missile Program. An essential factor in the development picture is one of overtime policy. It is, therefore, felt that the overtime policy presently applied to the ICBM/TREM Program should be broadened to include the 117L Program. In respect to the overtime policy, authority is requested to consider the 117L Program as a portion of the Ballistic Missile Program.

FOR THE COMMANDER:

cc: Lt Col Sexay, MCPDA

ORIGINAL SIGNED BY
SHERMAN E. ELIUS
Colonel, USAF
Chief, Production Staff Division
Deputy Director/Ballistic Missiles
Directorate/Procurement & Production

DOWNGRADED AT 12 YEAR INTERVALS: AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

CONFIDENTIAL
AFDRD-SS

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON D.C.

Rdz 198

NOV 27 1957

SUBJECT: Approval of Development Plan for WS 117L

TO: Commander
Air Research and Development Command
Post Office Box 1395
Baltimore 3, Maryland

1. The revised Development Plan for WS 117L dated 16 July 1957 is approved.

2. There is a possibility that the development of WS 117L may be accelerated in the near future due to the active national interest in systems of this type.

3. Due to the recent change in the development urgency associated with this system, and a finalization of funding requirements, a revised Development Plan outlining new goals and objectives is required. It is therefore recommended that the revised plans:
   a. Restate the expected capabilities as design objectives.
   b. Provide more detailed information on the development and testing of the airborne and ground components of the sensor systems.

4. More detailed information and drawings on each sub-system are required in this headquarters. It is recommended that this be accomplished by appendices to the Development Plan or by Status Reports.

FOR THE CHIEF OF STAFF:

[Signature]

H. A. Schell
Brigadier General, USA
Deputy Director of Research and Development
Office, DCS/Development
UNCLASSIFIED

CITE TWX 12-009. THE FOLLOWING LETTER FROM GENERAL BOUSHEY TO COMMANDER ARDC IS BEING FORWARDED TO YOU OFFICIALY, AND IS QUOTED NOW FOR YOUR EARLY INFORMATION. INDEPENDENT OF THE AIR FORCE NOV 27 1957 SUBJECT APPROVAL OF DEVELOPMENT PLAN FOR WS117L TO COMDR ARDC BALTIMORE MD

1. THE REVISED DEVELOPMENT PLAN FOR WS 117L DATED 16 JULY 1957 IS APPROVED.

2. THERE IS A POSSIBILITY THAT THE DEVELOPMENT OF WS117L MAY BE ACCELERATED IN THE NEAR FUTURE DUE TO THE ACTIVE NATIONAL INTEREST.

PAGE TWO

3. DUE TO THE RECENT CHANGE IN THE DEVELOPMENT URGENCY ASSOCIATED WITH THIS SYSTEM, AND A FINALIZATION OF FUNDING REQUIREMENTS, A REVISED DEVELOPMENT PLAN OUTLINING NEW GOALS AND OBJECTIVES IS REQUIRED. IT IS THEREFORE RECOMMENDED THAT THE REVISED PLAN CLN

A. RESTATE THE EXPECTED CAPABILITIES AS DESIGN OBJECTIVES.
B. PROVIDE MORE DETAILED INFORMATION ON THE DEVELOPMENT AND TESTING OF THE AIRBORNE AND GROUND COMPONENTS OF THE SENSOR SYSTEMS.
C. MORE DETAILED INFORMATION AND DRAWINGS OF EACH SUB-SYSTEM ARE REQUIRED IN THIS HEADQUARTERS. IT IS RECOMMENDED THAT THIS BE ACCOMPLISHED BY APPENDICES TO THE DEVELOPMENT PLAN OR BY STATUS REPORTS. FOR THE CHIEF OF STAFF H A BOUSHEY BGEN USAF DEPUTY DIRECTOR OF RESEARCH AND DEVELOPMENT OFFICE, DCS/DEVELOPMENT UNQUOTE

BT

03/1946Z DEC RJEPYB
FROM: COMDR HQ ARDC
TO: COMDR AFBMD

UNCLASSIFIED FROM RDZCP-12-4-E. FOR WDG, ATTN: GENERAL RITLAND. REFERENCE: TWX, H-033, QUOTING HQ USAF LETTER, DATED 7 NOV 1957. YOU ARE AUTHORIZED TO COMMIT AND OBLIGATE $100,000 FOR PRELIMINARY DESIGN STUDIES ON THIS PROJECT. FUNDS IN THIS AMOUNT WILL BE MADE AVAILABLE UNDER A 621609A.
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON 25, D. C.

REPORT OF THE SCIENTIFIC ADVISORY BOARD
AD HOC COMMITTEE ON SPACE TECHNOLOGY

6 December 1957
Sputnik and the Russian ICBM capability have created a national emergency. In the rocket field the Air Force should make a maximum contribution to a proper national response. The following active programs are recommended:

1. Obtain a massive first generation IRBM and ICBM capability as soon as possible.

2. Establish a vigorous program to develop second generation IRBM's and ICBM's having certain and fast reaction to Russian attack.

3. Accelerate the development of reconnaissance satellites.

4. Establish a vigorous space program with an immediate goal of landings on the moon.

5. Obtain as soon as possible an ICBM early warning system.

6. Pursue an active research program on anti-ICBM problems. The critical elements are decoy discrimination and radar tracking. When these problems are solved a strong anti-ICBM missile system should be started.

Mr. David T. Criggs
Dr. Clark B. Millikan
Dr. Mark H. Mills
Mr. W. H. Radford
Dr. H. Guayford Stever
Dr. Edward Teller
Dr. C. S. White
DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS UNITED STATES AIR FORCE  
WASHINGTON 25, D.C.  

Scientific Advisory Board to the Chief of Staff  

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THE ANDOVER BRIDGE CORPORATION

LOS ANGELES, CALIFORNIA

INTEROFFICE CORRESPONDENCE

TO: L. G. Dunn
CC: D. G. Tilton, M. J. C. O. O'Brien
DATE: 18 December 1934

SUBJECT: Contract Organization for Project Alba

FROM: L. G. Dunn
Mr. Eugene Root  
Vice President and General Manager  
Lockheed Aircraft Corporation  
Missile Systems Division  
P. O. Box 500  
Sunnyvale, California.

Dear Mr. Root:

This is in reply to your letter of 26 November 1957 (L352/36L69). As was discussed in the meeting at the Air Force Ballistic Missile Division on 5 December 1957, I think it highly desirable that specific development planning toward the augmentation and acceleration of the present MS 117L program be accomplished without delay between L352 and AFMD.

In order to be effective, any recommendations we wish to make to the Air Staff in this regard can not be delayed too long. Accordingly, I suggest that every attempt be made to complete the planning phase for final review by no later than 15 January 1958, and earlier if possible.

It would seem most desirable if your goal for the new program were specifically directed toward the most important reconnaissance payloads. While the use of infra-red sensors may well be of future importance I am not convinced that we have gone far enough to warrant its use in the early program. On the other hand, the use of a recovery package is a worthwhile backup to our present MS 117L data recovery concept.

I appreciate your efforts toward the streamlining of the Lockheed Missile Systems Division organization for the MS 117L task and believe that these are essential. There are several factors, most of recent origin, which make me doubt that on the part of the Air Force, we can go as far in our streamlining of organization as was the case in the project you mentioned which Kelly Johnson headed for Lockheed.
As to your question on the role Kelly Johnson could play,
I am sure you are in a better position than I am to consider this.
I do believe, however, that Mr. Johnson's knowledge of how to
control and operate an expedited program would be of exceptional
value to LSD's work on W3 117L.

Sincerely,

ORIGINAL SIGNED:
B. A. SCHRIEVER