|  |  |
| --- | --- |
| PRET Re-Testing and Validation | |
| Task Authorization #2 | |
| Item 6: PRET Task Completion Times | |
|  | |
| Prepared For | Leena Tomi |
|  | Deputy Chief |
|  | Operational Space Medicine |
|  | Canadian Space Agency |
|  |  |
|  | Dr. Christian Lange |
|  | Senior Engineer |
|  | Exploration Planning |
|  | Canadian Space Agency |
|  |  |
| Submitted | July 19, 2016 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Classify Information Task (CIT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 155 | 159 | 158 | 157 |
| Median | 153 | 156 | 162 | 157 |
| Std Dev | 16 | 22 | 18 | 19 |
| Minimum | 125 | 124 | 125 | 125 |
| Maximum | 201 | 223 | 189 | 204 |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time between the onset of the first CIT message and the onset of the last CIT message. * A total of 30 CIT messages were presented in Phase 2. This was increased to 32 messages in Phases 3 and 3E. * The CIT was changed from 3-AFC in Phase 2 to 2-AFC in Phases 3 and 3E * The values reported in the “Phase 3 Ext.” column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3E. | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Geological Database Consistency Check Task (GDCCT)** | | | | | | | | |
|  | Phase 2  (n=50) | | Phase 3  (n=160) | | Phase 3 Ext.  (n=40) | | Average  (n=250) | |
|  | Match | Mem | Match | Mem | Match | Mem | Match | Mem |
| Mean | 131 | 34 | 139 | 33 | 126 | 28 | 132 | 32 |
| Median | 126 | 32 | 139 | 33 | 119 | 27 | 128 | 31 |
| Std Dev | 29 | 9 | 25 | 8 | 28 | 6 | 27 | 8 |
| Minimum | 92 | 12 | 91 | 18 | 74 | 18 | 86 | 16 |
| Maximum | 240 | 53 | 211 | 64 | 213 | 44 | 221 | 54 |
| Notes:   * Completion times are measured in seconds. * Completion times are split into the two parts of the GDCCT (Matching and Memory) and are shown in the “Match” and “Mem” columns, respectively. * Completion times in the Matching phase are calculated as the time between the onset of the first matching trial and the onset of the last matching trial. * Completion times in the Memory phase are calculated as the time between the onset of the first memory trial and the onset of the last memory trial. * The values reported in the Phase 3 Extension column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3 Extension. | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Letter-Number Sequencing Auditory Task (LNSAT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 185 | 200 | 70 | 152 |
| Median | 181 | 192 | 69 | 147 |
| Std Dev | 115 | 99 | 22 | 79 |
| Minimum | 22 | 21 | 28 | 24 |
| Maximum | 521 | 619 | 110 | 417 |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time between the onset of the first letter/digit in the first LNSAT string and the onset of the first/letter digit in the last LNSAT string. * The presentation rate was increased from 1 letter/digit per every 3 seconds to 1 letter/digit per second in the Phase 3E. * The values reported in the “Phase 3 Ext.” column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3E. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Response Control Task (RCT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 115 | 934 | 794 | 614 |
| Median | 117 | 956 | 817 | 630 |
| Std Dev | 8 | 212 | 113 | 111 |
| Minimum | 77 | 266 | 527 | 290 |
| Maximum | 129 | 1359 | 999 | 829 |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time between the onset of the first RCT message and the onset of the final RCT message. * The RCT was changed so that it no longer occurred at predetermined times (e.g., during rock extraction) in the mission scenario for Phases 3 and 3E. Instead, the RCT occurred throughout the entire mission, which is why the completion times are substantially longer in those two phases. * The values reported in the “Phase 3 Ext.” column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3E. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Perform Mission Relevant Calculations Task (PMRCT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 28 | 44 | 33 | 35 |
| Median | 19 | 40 | 32 | 30 |
| Std Dev | 24 | 13 | 6 | 14 |
| Minimum | 4 | 25 | 23 | 17 |
| Maximum | 124 | 100 | 54 | 93 |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time to acknowledge the message (Phase 2 only) plus the time to perform the mental calculation(s), plus the time to make the decision whether or not to power down the Rover. * In Phase 2, it was possible to acknowledge the message before the RT clock was started (resulting in a negative RT). These negative RTs were not included in these completion time calculations. * The number of mental calculations was increased from 1 to 5 in Phases 3 and 3E. * The values reported in the “Phase 3 Ext.” column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3E. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Suspension Control Task (SCT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 122 | 104 | 104 | 110 |
| Median | 122 | 104 | 103 | 110 |
| Std Dev | 3 | 3 | 3 | 3 |
| Minimum | 117 | 95 | 97 | 103 |
| Maximum | 130 | 112 | 113 | 118 |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time between the onset of the first SCT stimulus and the onset of the last SCT stimulus. * The values reported in the “Phase 3 Ext.” column represent averages collapsed across the 10 testing sessions. * The values in the Average column represent averages collapsed across Phases 2, 3, and 3E. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Path Planning Task (PT)** | | | | |
|  | Phase 2  (n=50) | Phase 3  (n=160) | Phase 3 Ext.  (n=40) | Average  (n=250) |
| Mean | 30 |  |  |  |
| Median | 25 |  |  |  |
| Std Dev | 17 |  |  |  |
| Minimum | 10 |  |  |  |
| Maximum | 86 |  |  |  |
| Notes:   * Completion times are measured in seconds. * Completion times are calculated as the time between the onset of the PT task and the participant’s response. | | | | |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Off-Nominal Tasks (Phase 2: n=50)** | | | | | |
|  | Drive to Extraction | Extraction | Drive to ISRU | Drive to Bonus | Total Time |
| Mean | 490 | 145 | 411 | 460 | 1472 |
| Median | 498 | 117 | 431 | 386 | 1448 |
| Std Dev | 182 | 107 | 190 | 219 | 280 |
| Minimum | 244 | 17 | 71 | 268 | 953 |
| Maximum | 989 | 488 | 837 | 1321 | 2529 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Off-Nominal Tasks (Phase 3: n=160)** | | | | | |
|  | Drive to Extraction | Extraction | Drive to ISRU | Drive to Bonus | Total Time |
| Mean | 592 | 77 | 462 | 373 | 1463 |
| Median | 549 | 47 | 452 | 312 | 1389 |
| Std Dev | 286 | 104 | 183 | 148 | 347 |
| Minimum | 126 | 12 | 98 | 229 | 966 |
| Maximum | 848 | 848 | 1058 | 1085 | 3201 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Off-Nominal Tasks (Phase 3 Extension: n=40)** | | | | | |
|  | Drive to Extraction | Extraction | Drive to ISRU | Drive to Bonus | Total Time |
| Mean | 472 | 56 | 299 | 366 | 1168 |
| Median | 480 | 49 | 301 | 354 | 1172 |
| Std Dev | 151 | 25 | 77 | 56 | 152 |
| Minimum | 174 | 23 | 126 | 285 | 859 |
| Maximum | 776 | 123 | 452 | 532 | 1457 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Off-Nominal Tasks (Average: n=250)** | | | | | |
|  | Drive to Extraction | Extraction | Drive to ISRU | Drive to Bonus | Total Time |
| Mean | 518 | 93 | 391 | 400 | 1368 |
| Median | 509 | 71 | 395 | 351 | 1336 |
| Std Dev | 206 | 79 | 150 | 141 | 260 |
| Minimum | 181 | 17 | 98 | 261 | 926 |
| Maximum | 871 | 486 | 782 | 979 | 2396 |