This memorandum provides a detailed description of circuit changes to the Raytheon MagnaStar ARTU, in response to a request from Mr. Andy Leimer at your organization.

The changes will be addressed at the circuit card assembly level.

1.0 MagnaStar ARTU Electronic subassemblies:
- 1.1 Power Supply Assembly: No changes
- 1.2 RF Power Amplifier CCA (Circuit Card Assembly): Updates listed in section 2.1
- 1.3 RF Down Converter CCA: Updates listed in section 2.2
- 1.4 BBSP (Base Band Signal Processor) CCA: Updates listed in section 2.3
- 1.5 Transmit IF Circuit Card Assembly: No changes
- 1.6 Receive IF Circuit Card Assembly: No changes
- 1.7 ARTIC (Airborne Radio Telecom Interface Controller) CCA: Updates listed in section 2.4
- 1.8 ARTEX (Airborne Radio Telecom Extended) CCA: Updates listed in section 2.5

2.0 The information below identifies the circuit changes, device reference designations for the parts that are on the RF CCA's and the corresponding circuit schematic page in Exhibit I of the submittal. The ARTIC CCA and ARTEX CCA are not RF assemblies and therefore these assemblies have not been included in the schematics of Exhibit I. Only one circuit change, on the ARTIC CCA and as detailed in section 2.4, was an enhancement to the ARTU. All other changes were required for the replacement of obsolete parts. The resulting circuit changes maintained the form, fit and function of the original product configuration.

2.1 **RF Power Amplifier CCA**:

The 4 bit digital attenuator in the RF amplifier chain (AT1) and in the equalization network (AT3) was changed from a custom pinout part to the manufacturer's standard off-the-shelf part. This involved the swapping of two control lines on the part. AT1 is located on page 10 of exhibit I. AT3 is located on page 12 of exhibit I.

The bandpass filter (FL1) was changed from a ceramic to a surface acoustic wave filter. FL1 is shown on page 10 of exhibit I.

The final amplifier was updated to utilize an MRF183 RF power device, replacing the previous component that had gone obsolete. The Q19 circuit is shown on page 12 of exhibit I.

2.2 **RF Down Converter CCA:**

The Low Noise Amplifier (LNA) was changed to incorporate a new coupler (U29), a new gain-controlled amplifier device (U27), and added a gain control interface device (Q9). The output bandpass filter of the LNA was changed from a ceramic filter to a surface acoustic wave bandpass filter (FL6). This circuit is located on page 38 of exhibit I.

Due to the synthesizer circuit changes, which will be described below, the 10 MHz distribution circuit was changed to incorporate a discreet 4-way splitter. This circuit includes L7, L8, L9, L13, C84, C85, C89, C94, C95, C96, R69, R74, R79, & R87. This circuit is located on page 37 of exhibit I.

The 820 MHz Synthesizer was simplified by using a commercially available VCO (G1) and parallel input synthesizer device (U19), instead of the original discreet design. This eliminated the need for two prescalers, a phase detector, and a tuned filter. The 820 MHz Synthesizer circuit output was further simplified by replacing a tunable helical filter with a surface acoustic wave bandpass filter (FL4). Amplifier U22 that amplifies the bandpass filter output was replaced with a commercially available part. This circuit is located on page 36 of exhibit I.

The 20.48 MHz synthesizer circuit was reduced in complexity to a single device (U16) that uses the 10 MHz reference and generates the 20.48 MHz output. This circuit update eliminated an obsolete parallel input PLL device, two frequency reference dividers, and a discreet VCO. This circuit is located on page 37 of exhibit I

The CCA's digital interface circuit was updated to replace an obsolete programmable logic device. The new programmable logic device is U25 and the circuit is located on page 37 of exhibit I.

The 40 MHz signal source circuit had U15 replaced with a new commercially available hybrid amplifier. This circuit is located on page 37 of exhibit I.

Amplifier U30 in the 70 MHz signal path to the Receive IF CCA was replaced with a commercially available part. This amplifier is located on page 39 of exhibit I.

2.3 **BBSP (Base Band Signal Processor) CCA**:

Due to obsolescence, the ADSP2111 digital signal processors were replaced with ADSP2181's that are a newer design of the same family. The use of the ADSP2181 supported the existing ADSP2111 core application software. The reference designations of these parts are U21, U22, U29, U30, U31, U33, U40, & U41. These parts are located on pages 20, 21, 22, 24, & 25 of Exhibit I.

Two obsolete BI-FIFO (Bi-directional First-in First-out) devices were replaced with one FPGA (U99) that provided the same functionality. This part is located on page 33 of Exhibit I.

A new device was added to the BBSP to interface with the host processor on the ARTIC CCA. The device function is Internal Direct Memory Access (IDMA) interface and the reference designation is U98. This part is located on page 32 of Exhibit I

.

2.4 **ARTIC (Airborne Radio Telecommunications Interface Controller) CCA:**

Due to obsolescence, the ADSP2111 digital signal processor was replaced with an ADSP2181 that is a newer design of the same family. The use of the ADSP2181 supported the existing ADSP2111 core application software. The reference designation of this part is U49.

The obsolete host processor (376) was replaced with the newer design of the same family (386SX). The new processor is backward compatible with the 376 and therefore supported the existing software. The reference designation of this part is U43.

The Flash EPROM and NVRAM were changed from smaller capacity obsolete devices to newer parts with greater capacity.

The only enhancement feature to the new ARTU is the addition of a second CEPT-E1 port. The circuit modification for this enhancement required the addition of one interface device, U101

2.5 **ARTEX (Airborne Radio Telecommunications Extended) CCA:**

The ARTEX CCA was modified to connect the second CEPT-E1 port from the external radio connector, J1, to the ARTIC CCA.