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OP ENGINEERING  
us Meeting Minutes  
November 1981  
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2 - DEC 1981

FIELD SERVICE

asked if this expense is worth it relative to the problems we are presently seeing. If so, it will take three to four weeks minimum to add this board to displays. Decision on this is still pending.

COLOR X-Y: Phosphor Burn Problem

Fixes to prevent this problem has been implemented on all displays built by Wells-Gardner since: a) additional wire starting 10/22/81; b) glued pot starting 11/2/81; c) Rev. D Tempest PCBs starting 11/4/81.

FCC (continue): methods would be required. It may prudent to order and inventory some components that would allow us to comply with the expected rules on very short notice. A list of such items shall be forwarded to Coin-Op Materials Group by Rick Moncrief.

COMPONENTS ENGINEERING

CENTIPEDE 82S16 RAM PROBLEM: Signetics 82S16 - Removed from AVL.  
MMI - On AVL with new part number.  
Fairchild 93421 - On AVL  
AMD 27LS00/27LS0 - On AVL

VCS POP POTENTIOMETER PROBLEM

Purchasing has made a buy on a production quantity of CTS potentiometers to substitute for the 19-9031 Allen-Bradly potentiometer. A new part number will be assigned to the CTS part as it is not electrically or mechanically identical.

IC SOCKETS

Four vendors of IC sockets have been evaluated and approved (R-N, AMP, Burndy, and Augat). A test report will be published.

COLOR X-Y TRANSFORMER

Rev. B of the 142005 color X-Y transformer increasing one of the secondary voltages has been released. This change will have no impact on our present AVL listed vendors. A sample transformer from an Irish vendor is being evaluated.

PC DESIGN

MISSILE COMMAND DELUXE - Layout will start 8/3/81.  
AMAZING ADVENTURE - Layout over half completed.  
MAZE INVADERS - Schematics will be completed early this week.  
SPACE DUEL - Film and Fab 7/31/81.  
FORCE FIELD - Schematic inputs due in PC Design 8/5/81.

PUBLICATIONS

CENTIPEDE, TM-182, 2nd print - Manual  
DP-182-01,-02, 2nd print - Schematics package  
ST-182, 2nd print - Self Test Label  
DP-192, 1st print - Signature Analysis Guide

Have been received.

CAT BOX, TM-179, 1st print

Plan for manual being sent to printer on 8/21/81, looks good. Engineering and Field Service reviews expected about second week of August.

TEMPEST-Expect to be ready to go to press about 8/27/81.

MECHANICAL DESIGN

INFINITY MIRROR-There has been a one week delay in starting concepts for a cabinet design using the partial reflective mirror. The delay was because of higher priority projects.

CAT BOX-Shipping container package is complete and will be released today.

HALL EFFECT SWITCH-Two more prototypes on order with large surface area and other revised changes due to engineering requests.

CONFIDENTIAL

K. Hayes

Dan Van Elderen

Dan Van Elderen

Chris A. Downend

Chris Downend  
8/12/81

18/8/81

COIN-OP ENGINEERING  
Status Meeting Minutes  
7 August 81

ATTENDEES: E. Logg, R. Pescatore, J. Evenson, B. Dunster, R. Woodard, G. Opperman, H. Langhans, T. Burke, R. Moncrief, P. Takaichi, G. Bailey, L. Rains, F. Ballouz, L. Butcher, D. Hawes, M. Hoff, D. Van Elderen.

VIDEO:

CENTIPEDE-E. Logg

Atari began placing UL labels on upright Centipede games Monday, Aug. 10, 1981! PCB build continues using REV. G PCB's; build was started 6-Aug-81. The REV. G PCB trackball problems have been corrected by changing the (8) .1 uf caps to .01 uf. 19" cocktail pre-prod build of 25 units scheduled to begin 8/11. The opto-coupler now has -01 and -02 suffixes. The -02 is a specially screened part that works with Centipede PCB REV's A-F. The wide-tolerance -01 parts can only be used with REV. G or later PCB's. All future builds of 14" cocktail will probably use Electrohome monitors.

TEMPEST-M. Hoff

Upright CSA visit: 8/17/81

On the upright, everything is production released except the attract panel decal, the shipping container, and the program memory set. Program memory set scheduled for release on 8/21. Upright pre-prod build of 10 units continues. Pre-prod build review occurred 8/7. One was delivered to Product Safety on 8/6 for UL visit on 8/14. Cocktail pre-prod planning meeting occurred 8/3. 15 units are scheduled to be built with a Review scheduled for 9/18. Assembly of upright is scheduled to begin 17-Sep-81.

SPACE DUEL-S. Calfee

Upright was placed on Field Test 31-Jul-81. The first week of collections look very promising.

FORCE FIELD-T. Hogg

2nd Engineering Review: 9/17/81

Schematics have gone to PC Design. Software development continues.

MAZE INVADERS-D. Snyder

1st Engineering Review: 8/18/81

On schedule for 1st Engineering Review next week. PC Design expects to start PC layout this week.

SPACE SHOOT-H. Delman

Focus Group: 8/21/81

Development continues toward Focus Group on 27-Aug-81. Initial schematics have been delivered to PC Design.

AMAZING ADVENTURE-R. Moore

1st Marketing Review: 8/21/81

Brainstorming session occurred 4-Aug-81, where the gameplay concepts were refined and specific goals for 1st Marketing Review were set. Revised schedule ready next week.

MISSILE COMMAND DELUXE-J. Ray

3rd Engineering Review: 11/9/81

Newly-assigned programmer will start 17-Aug-81. PC Design has completed schematics and PC layout has begun.

HYPERSPACE-M. Hally

1st Engineering Review: 8/17/81

Work continues toward 1st Engr. Review 17-Aug-81.

7 KEVIN HAYES  
COIN-OP ENGINEERING  
Status Meeting Minutes  
25 June 1982

FIELD SERVICE  
JUL 1982  
CONFIDENTIAL

Dan Van Elderen  
Dan Van Elderen  
Chris Downend  
Chris Downend  
6/28/82

Attendees: T. Burke, D. Charrier, S. Deus, B. Fleischman, M. Fujihara, M. Hally, K. Harkness, D. Hawes, T. Huntsman, H. Langhans, S. Mangat, D. Maslana, F. McCord, R. Moncrief, G. Opperman, L. Rains, J. Ray, D. Reckert, W. Sauter, M. Savage, D. Storie, S. Storms, J. Vaughn, G. Victorine, W. Woodworth

DIG DUG-J. Ray

Finished Goods Assembly continues in all cabinet configurations. Field test continues. 4 Credit/Coin bug appears to be associated with a custom I.C. so isolation has been difficult. Expect to phase-in new program memory masters to fix the "speed-slow-down" bug.

KANGAROO-D. Storie

Finished Goods Assembly continues through July. The Matsushita monitor horizontal re-trace problem has been judged insignificant. Field tests continue.

GRAVITAR-M. Hally

Cabaret (19") DRB/UL Review: 6/24/82 Prod Rel: 6/29/82  
Cocktail (19" Amplifone) DRB/UL Review: 7/14/82 Pre-Prod Rel: 7/19/82

Pre-Prod Build Review occurred 6/24. Field test continues at 7-11. Slam switch will be ECNed out of all cabinet configurations. Cabaret will be Production Released 6/29 rather than Pre-Prod Released.

LIBERATOR-C. Downend

Upright Prod Rel: 8/17/82

Cabaret (19") Marketing Review: 7/1/82  
Cocktail (14") Marketing Review: 7/29/82  
European Upright (19") Marketing Review: 6/28/82

Everything is Pred-Prod Released except PCB Assembly Drawing, P/L, Schematic and Memory masters - all expected 6/25. (Pre-Prod Build scheduled for 7/14 - PCB's) Meeting on 6/24 resulted in decision to stay with existing Upright Cabinet Design. Field test continues.

FAST FREDDIE-S. Deus

USA Upright Pre-Prod Marketing Review: 7/26/82

Irish Finished Goods - 500+ PCB's shipped from Japan to Ireland 6/21 ... Remainder expected by 6/25. Program bug may exist which could delay shipment of Irish product. Software changes for USA version: Documentation shipped - they will start implementation 6/28.

MAZE INVADERS-D. Snyder

Prod Rel: Pending

Five field test units shipped by 6/23. Everything is Pre-Prod Released except: Graphics- No target date; PCB Documentation scheduled for 6/30.

RUNAWAY-R. Moore

Field Test: 8/6/82

Development continues toward 8/6/82 field test.

BLACK WIDOW-M. Hoff

Field Test: 6/30/82

On schedule for field test 6/30. Plan to have 2 or 3 more field test cabinets ready by the end of July.

DRAGON RIDER-C. Downend

Field Test: 9/24/82

Focus Group occurred 6/24 ... response was "middle-of-the-road" compared to recent Focus Groups.

TOPOROIDS-S. Fuller

1st Engineering Review: July '82

Preliminary Engineering Review occurred 6/17; Promising game features were demonstrated.

DEVELOPMENT CONTINUES ON THE FOLLOWING PROJECTS:

4 x 4-M. Loper 2nd Marketing Review: 7/29/82  
TARGET OUTPOST-Ralston/Hally 5th Engineering Review: 7/28/82  
WEATHER WAR-R. Adam 3rd Marketing Review: 9/23/82  
HEIST-M. Loper 2nd Marketing Review: Pending  
WARP SPEED-M. Hally 1st Marketing Review: July '82  
MILLIPEDE-E. Logg 1st Marketing Review: 7/7/82

MECHANICAL ENGINEERING STATUS REPORT  
JUNE 5, 1984

*Handwritten signature and date: 5.6.84*

APER BOY CONTROL: Parts are being made in the Model Shop to build two more controls. The drawings are being completed to send out for quotes. \*\*\*Field test June 16th

ANTI-GRAVITY GAME: A new programmer has been assigned to the project, the impact to the schedule is unknown at this time. Dave Storie is back full time on the electronic hardware design and development. Rev 5, X-Y plotter system drawing is ready for build up of prototype to be used for first Engineering Review. The layout and details are complete for the latest design of the X-Y drive. Drawings are in the Model Shop. Still waiting for prototype slides. Looking to have a working model June 12th. Piece part drawings for the prototype cabinet are being drawn. Looking into ways to support the front glass. Glass is expected to weigh approximately 40 to 50 pounds so there is a concern about the safety of having to remove it in the field. We are looking into an aluminum extrusion for framing and hinging or as a handle to grab onto. \*\*\*\* 1st Engineering Review week of June 20th

LAST STARFIGHTER: Prototype PCB cage to be completed by the Model Shop June 5th.

MAJOR HAVOC (Encoder wheel): Due to sharp corners and thin cross section in the spline area of the encoder wheel, a number of units have failed in the field. To resolve the problem, Otto has made a small metal sleeve or band which fits around the weak area of the wheel. He has tested the wheels with and without the band, and was unable to break the one with the band, so feels this should solve the problem. A drawing will be made and the part will be incorporated into the assembly. The Model Shop will make 50 parts for Customer Service. The part should add approximately .10 to .25 per control. Customer Service will have the parts by June 7th.

GOLF SIMULATOR: Review this week.

COIN DOOR (ACTION DISC VERSION): Four coin doors with enclosures were delivered on June 4th. These are for the four Roadrunner games to be built later this month.

ELECTRONIC MULTI-MECH: Awaiting field test unit from Chapman. \*\*\* Field test in June.

SUPER SONIC SCREEN: Waiting for the plan to be finalized.

INFINITY MIRROR: The K-10 mirror received last week was incorrect. The factory acknowledged making an error in the radius (30" instead of 52") and will send us another mirror as soon as they can, possibly by the end of the week.

HALL EFFECT JOYSTICK: Fourteen complete joysticks have been built for Singh Mangat who will use them to establish test procedures. Waiting for a commitment before starting a full time effort on the handle to be used on "Nightmare". \*\*\*\* Prototype evaluation June 1st.

MOVING SEAT HYDRAULIC SYSTEM: No changes.

ANALOG BUTTON: (Bozo Button) A design has been found to "snap-in" vertically two magnets which are required to use with hall effect sensors. However, due to a possible change in priority, the date for the first prototype of this control will be determined at a later time.

4 X 4: Still on field test. First weeks collections ranked it third out of twenty games in the arcade at \$120, number one game earned \$160. and number two earned 150. The game will be on field test about three more weeks.

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In-Op Engineering  
Status Meeting Minutes  
13 March 1981

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COLOR XY TRANSFORMER SPEC AND SAMPLES

Specification for color XY power supply transformer is at the sign-off stage.

AM6012 (D to A Converter)

AMD, Special Projects and Components are working on a variety of items to determine if it's the part or design or maybe both that causes video problems.

HALL EFFECT SWITCHES

Samples due in next week; cost looks very competitive.

UL ASTEROIDS DELUXE

In process of installing harness and design improvement.

ASTEROIDS DELUXE

Video taping for copyrights completed 3/11/81.

CAT BOX

4/10/81 is the scheduled date to deliver manuals (50) to Fred McCord,

FIELD SERVICE SEMINAR MANUAL

Response from eleven vendors of quotes for the printing of this manual should be received by 4/12/81. With Purchasing's cooperation the selected vendor will receive first installments of copy on 3/16/81.

KIDS COUNTER

Six weeks on token vend life test. Parts will be evaluated for wear. No progress on token cartridge.

TELESCOPIC TABLE LEGS

Final marketing review did occur on 3/13/81. Quotes and necessary documentation are complete. Marketing input was to proceed ASAP with incorporation into our existing cocktail table design, including phase in on Asteroids Deluxe and Warlords.

BFI ENCLOSURE

Presently working with a vendor to develop prototype enclosures for test and comparison. The various enclosures will be going out for quotes by the end of next week.

TRACKBALL

Drawing package of the large plastic unit is due 3/27/81.

RED BARON-JOYSTICK

The scheduled completion of the tool for the injection molded parts of the "joystick" control is 4/1/81.

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Open-Op Engineering  
Status Meeting Minutes  
March 1981

Dan Van Elderen  
Dan Van Elderen  
Chris A. Downend  
Chris Downend  
3/16/81

ATTENDEES: Tom Burke, Linda Butcher, Steve Calfee, Chris Downend, Dennis Hawes, Hugh Langhans, Fred McCord, Rick Moncrief, George Opperman, Lyle Rains, John Ray, Mike Savage, Howard Slade, Dave Stubben, Pete Takaichi, Bob Weiss, Rob Woodard, Dan Van Elderen.

VIDEO:

ASTEROIDS DELUXE-D. Shepperd  
Asteroids Deluxe uprights are in production. Several hundred units were boxed with the coin mode set at 50¢ play. These units will be opened and reset.

RED BARON-J. Ray  
EPROMs released 3/11/81. Pre-Prod Design review of sit-down Red Baron cabinet happened on 3/12/81.

WARLORDS-R. Weiss  
EPROMs to be released this week. Bezel will be released today, 3/16/81.

CENTIPEDE-E. Logg Final Review: 4/15/81 Pre-Prod: 5/1/81  
Upright at Mountain View Time Zone is earning extremely well. Player Survey occurred 3/6/81 to 3/7/81. Report from Marketing Research is forthcoming. PCB artwork scheduled for completion at the end of March. Functional proto PCBs expected by mid-April.

ALIENS-M. Hoff *TRAPST* Field Test: 3/26/81  
Field test date has been slipped to 3/26/81. Expect to deliver AVG PCB schematics to Engineering Services 3/17/81.

ASTEROIDS II-S. Calfee *SPACE DUEL* Sixth Marketing Review: 3/26/81  
Marketing Review and Field Test slipped one week to 3/26/81 and 4/3/81 respectively.

STAR TRAP-T. Hogg  
Still out on Field Test.

CHASE-O. Rubin  
On schedule for Pre-Prod pending return of Field Test cabinet-expected 3/18/81.

CAT BOX-J. Ray  
First 5 prototypes schedule for completion 3/13/81. Second group of 45 units delayed until mid-April due to parts shortages (switches and connectors).

KIDS COUNTER-D. Stubben Field Test: March, 1981  
Marketing Research report on Focus Group is forthcoming. Work is progressing slowly until further direction is received from McDonalds.

MAZE INVADERS-D. Snyder Marketing Review: 4/15/81  
Software progressing slowly.

AMAZING ADVENTURE-R. Moore Second Engineering Review: 4/7/81  
Software development continues. Project on schedule.

K. Hayes

*Dan Van Elderen*

Dan Van Elderen  
6/29/81

*Chris Downend*

Chris Downend

# CONFIDENTIAL

## FIELD SERVICE

IN-OF ENGINEERING  
Status Meeting Minutes  
26 June 1981

**ATTENDEES:** T. Burke, B. Dunster, J. Evenson, D. Hawes, H. Langhans, F. McCord, R. Moncrief, R. McDowell, G. Opperman, L. Rains, W. Sauter, D. Stubben, M. Takatsuno, B. Woods, R. Woodard.

**VIDEO:**

**RED BARON-J. Ray**

White labels delivered by Publications to cover "Battle Zone" on footstep. ECN is being cut. Side panel decals reach unnecessarily high precluding use of suction cup crane at 1215. Apparently it is too late to do anything to rectify it without delaying production.

**CAT BOX-J. Ray**

Five PCB prototypes due 6/25/81. Production release will probably slip until just after the Fourth of July holiday. We will be changing the final assembly, adding an -02 version for the European transformer. Also, we will be developing packaging once it is determined what will be shipped with the CAT BOX. There will also be some minor changes to the artwork.

**CENTIPEDE-E. Logg**

Cabaret UL Visit: 7/13/81  
Cocktail UL Visit: 7/13/81

Upright: All documentation is released. Cabaret: All documentation is released. An ECN is forthcoming to delete decal insertion and replace it with a postcard to request same. 14" Cocktail: All documentation is released except shipping container. Drop test on 6/25/81...release on 6/29/81. Current plan is to build most of run with Matsushita monitors. However, the last 100 built in August will use Electrohome monitors; this requires extensive ECNs or a new release. Finished Goods Assembly (Upright) began 6/22/81. Some trackball problems may be surfacing. The Components Group reported that with maximum spin on trackball the output level of the phototransistor rises to ~2 volts. This voltage feeds a Schmitt trigger device which requires, best case, 1.5 volts VIH. We therefore could have a detection problem. Biasing changes seem to improve situation; an ECN to the main PCB is likely after further investigation. PCB Rev. F to be released 7/1/81. Wells-Gardner monitors with deguassing fix looks good. 19" Cocktail: No production is forecast. Pre-Prod build planning meeting occurred 6/25/81. Completion of build of 25 Pre-Prod units expected on 8/14/81.

**VORTEX-M. Hoff**

Upright UL Review: 8/10/81 Prod: 7/29/81  
Cocktail UL Review: 6/29/81 Pre-Prod: 7/23/81

Pre-Prod Build Planning Meeting on Upright occurred 6/22/81. Completion of build of 10 Pre-Prod units expected on 8/3/81. Production Release 8/10/81. Upright Final Marketing Review occurred on 6/19/81. A Production Release Marketing Review is expected prior to ROM release. Cocktail: Received harnessed cabinet 6/24/81; on schedule for 6/29/81 UL Review. NOTE: On Upright Vortex, engineering will supply five color X-Y monitors, and ten RF cages for the Pre-Prod build.

**SPACE DUEL-S. Calfee**

7th Marketing Review: 7/7/81

Software development continues toward Marketing Review on 7/7/81.

**FORCE FIELD-T. Hogg**

2nd Engineering Review: 6/29/81

Programming continues toward Engineering Review 6/29/81.



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<u>WEATHER WAR</u> -R. Adam	3rd Marketing Review: <u>9/23/82</u>
	Field Test: <u>10/7/82</u>
<u>WARP SPEED</u> -M. Hally	1st Marketing Review: <u>8/82</u>
<u>MILLIPEDE</u> -E. Logg	2nd Marketing Review: <u>8/6/82</u>
	Field Test: <u>8/13/82</u>
<u>ICE WORLD</u> -D. Sherman	2nd Engineering Review: <u>8/25/82</u>
<u>AMAZING ADVENTURE</u> -R. Moore	2nd Marketing Review: <u>8/26/82</u>
<u>POWER GEM</u> -H. Langhans	3rd Engineering Review: <u>7/28/82</u>
<u>TOLLIAN WEB</u> -M. Hoff	1st Marketing Review: <u>9/8/82</u>
<u>TOPORIDS</u> -S. Fuller	1st Engineering Review: <u>7/29/82</u>
<u>PARKING LOT</u> -T. Hogg	Preliminary Engineering Review: <u>8/19/82</u>
<u>ONSLAUGHT</u> -D. Snyder	Preliminary Engineering Review: <u>8/19/82</u>
<u>THOGS</u> -M. Loper	Preliminary Engineering Review: <u>8/25/82</u>
<u>HEART OF ICE</u> -M. Hally	Preliminary Engineering Review: <u>10/29/82</u>
<u>INTERCHANGE</u> -M. Albaugh	Field Test: <u>8/20/82</u>
<u>TIME TRAVELER</u> -J. Ray	Preliminary Engineering Review: <u>9/1/82</u>

MECHANICAL ENGINEERING & KINETIC GAMES

ENCODER WHEEL - PLASTIC ASSEMBLY

First article wheel now expected next week.

WELD TEST FIXTURE

Parts to complete the fixture are now in-house. Drawings are complete and fixture is being machined in the Metal Shop. Expect completion in one week.

HALL EFFECT JOYSTICK

Prototype of joystick is complete and we are awaiting assistance from electrical to design a P.C. Board with interface I/O to the pokey chip.

COMPONENTS ENGINEERING

MONITORS

SANYO - Final design units have arrived. To be evaluated after Matsushita. Parts list mark up indicating areas of needed clarification or definition has been sent to Rep's.

ELECTROHOME - Production line having problems getting units to sync in horizontally. Have sample in lab for analysis (this is on Dig Dug Games); problem is due to out-of-spec H-sync signals.

74LS259 - TI's problem is input noise, suggest use of 74259 in place.

2532 vs 2732 EPROMS - New study underway shows a shift towards the 2732 since 3 of 6 vendors make the fast version as compared to just TI on the 2532.

HARNESS DESIGN

GRAVITAR (COCKTAIL) - Ready for release if no changes occur during DRB.

LIBERATOR (EIRE) - On schedule for release 7/27. One built and waiting for cabinet.

MAZE INVADERS (UPRIGHT) - Second Pre-Prod Release 7/21 to remove slam switch from drawing.

PC DESIGN

Layouts in progress on 4 x 4, Target Outpost Aux, and Fast Freddie.

Schematics done on Dragon Rider, Weather War, and Ice World.

MILLIPEDE - Schematic being checked. Designer will review layout to determine whether present Maze Invaders can be modified, approximately 8/9.

PAT 9000 - Layout changes should be complete 7/23, film and fab 7/30 and assembly documentation 8/6.

SWITCH MODE P/S - Changes continue.