

# **ARTS2876**

I bXYfgHJbX]b[ 'h\Y'GY`Z

## 7 ci fgY Cj Yfj ]Yk

### GHJZZ:7cbHJWh:8YHJ]`g

### 7cbj Ybcfg

BUa Y	9a U]`	5j U]`UV]`]m	@cWJhjcb	D\cbY
>cgYd\^5`]nn]	9	Ncca žG_mdY`UbX#cf HYUa gʻVm	C b`]bY cf A cfj Yb 6fck b	H68
		Uddc]bha Ybh	-	

### GWkcc`7cbHJWhi±bZcfa Uh]cb

GWXcc``cZGcWJU``GWJYbWYg

Fcca '%) -

A cfj Yb 6fck b 7 &\$

Ya U]`. 'gcgg4 i bgk "YXi "Ui

d\cbY. '\$&'-',) '% \$+

### 7ci fgY 8YHJ] g

### 7 fYX]hDc]bhg\*\*

### Gi a a UfmcZh\Y 7ci fgY

### 7 ci fgY @YUfb]b[ Ci hMca Yg

%" 9 I d`U]b`\_Ym]ggi Yg`fY`Yj Ubhhc`gcW]c`c[]\W\`dYfgdY\Mj Yg`cb`h\Y`gY`Z

- &" 8]qh]b[i]q\`VYhk YYb`qcW[c`c[]WU``dYfqdYWh]j Yq`cb`h\Y`qY`Z
- ' " 5dd`mgcW]c`c[ ]WU``dYfgdYWIj Yg`cb`h\Y`gY`Zhc``]j YX`YI dYf]YbWY
- ("I gY'g\_j``g'UggcWjUhYX'k]h\ 'gW\c`Uf'm]bei]fm]bWi X]b['h\cgY'fY`UhYX'hc'Wf]h]WU`'UbU`mg]gž'Uf[ia Ybh UbX'k f]hhYb'YI dfYgglcb"

#### HYUWX]b[ GhfUhY[]Yg

#### FUh]cbU`Y.

 $H\g Wci fgY g VUgYX cb h Y Zc ck b [ df]bWd Yg.$ 

- %" Hc:\\MYUhY:\Ub']\bhY``Y\\Mi\U``migh]ai`\Uh]\b['gd\U\\Y'\Zcf'ghi\XYbhg'h\UhfYk\UfXg'\U\\M]j\Y'\Yb[\U[\Ya\Ybhk]h\\\\X\U``\Yb[]\b['\\X\b\\Mdhg
- &" Hc fYUX df]a UfmihYl hg k ]h\ci hih\Y i gY cZgYWcbXUfmigci fW/gžWca a YbhUf]Yg cf X][ YghYX gi a a Uf]Yg"
- ' "Hc ZcghYf`X]U`c[i Y`]b`UbX`ci hcZWUgg`VYhk YYb`gh XYbhgžUbX`k]h\`h\Y]f`hYUW\Yfg`]b`cfXYf`hc`WfYUhY U`Wca a i b]hmcZ`YUfbYfg
- ("Hc'fYUX'[YbYfcig`m
- ) " Hc 'WfYUhY 'U 'WccdYfUh| Y 'YUfb]b[ 'Yb| ]fcba Ybh
- \*" Hc YbWci fU[ Y ghi XYbhfYgdcbg]V] ]mhc h\Y VfcUXYf UWUXYa ]WWca a i b]lm

#### HYUWX]b[ GhfUhY[]Yq.

H\]g`Wci fgY`k]```Wcbg]ghcZU`hk c!\ci f``YWh fY`UbX`cbY!\ci f`h hcf]U``UbX`UggcW]UhYX`cb`]bY``YUfb]b[UWhj] ]h]Yg"

@YWnifYg. H\Y "YWnifYg'k] "Wa V]bY h\Y hYW\b]ei Yg'cZU'hfUX]h]cbU`"YWnifY'k]h\Y h\Y']bhYfUWn]cb'UbX X]U`c[i Y md]\WU`mUggcW]UhYX'k]h\Y hifcf]U`g" "Ghi XYbhg'UfY'YbWcifU[YX'hc'dUff]\M]dUhY'UWnjj Y`m]b "YWnifYg'Vmei Ygh]cb]b[ "UbX'Wcaa Ybh]b[ 'cb'h\Y'WcifgY'a UhYf]U`" "@YWnifYg'k] "`"fY`mcb'hYlhi U`'Wcaa YbhUfmž'Z]`a "UbX j]gi U`"]a U[Yfmhc'Yld']\WUhY'h\Y'WcbW'dhg'ZcibX']b'h\Y'fYUX]b[g"

 $\label{thm:condition} Hi hcf] U`g`k ]```VY`i gYX`hc`cf[Ub]gY`ga U```[fci dg`hc`YghUV`]g\`U`Wc``UVcfUhj Y`k cf_]b[Ybj]fcba Ybhk \YfY`gh XYbhg`WUb``YUfb`Zfca `cbY`Ubch\Yf''`$ 

 $FYUX]b[\ 'E'\ Ygh]cbg.':\ cf'YUWX'k\ YY\_mfYUX]b[\ z'mci''k\ ]```Z]bX'fYUX]b[\ 'Wca\ dfY\Ybg]cb'ei\ Ygh]cbg'dcghYX'hch\Y'I\ b]j\ Yfg]hm@A\ G'''H\YgY'k\ ]```\Y`d'hc'cf]Ybh'mci''k\ ]h\ 'fYgdYWh'hc'h\Y'Uf[\ i\ a\ Ybhg'dfYgYbhYX']b'h\Y\ Ugg][\ bYX'fYUX]b[\ g''\ A''\ Y''\ A'''\ A''\ A'''\ A''\ A''$ 

5ggYgga Ybh

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5XX]h]cbU`XYhJ]`g.

H68

 $\label{thm:conditional} \mbox{Hi fb]h]b'gYh]b[.'H\]g'Ugg][ba Ybh]g'gi Va]hhYX'h\fci [\'Hi fb]h]b'UbX'ghi XYbhg'WUb'gYY'Hi fb]h]b'g]a]'Uf]hm fYdcfhg''$ 

### 5 hm/b XUb WY F Yei ]fYa Ybhg

 $\hbox{Ghi XYbhg. UfY. ghfcb[`mYbWc'i fU[YX'hc. UhhYbX. U```WUggYg. UbX. fYj]Yk. ``YWhi fY. fYWcfX]b[g'' which is a substitution of the property of the property$ 

## **7**ctifg**f**gs**Y**xiGxVWYXi`Y

1	

		bUh fY`UbX`]hg`gcW]U``WcbX]h]cbg'ž6gd ZW[_[S` EfgV[Wežjc`"%%Zdd")!()
	Hi hcf]U`	5g gWXYXi `YX
K YY_'(.', 'A UfWX'!'‰ A UfWX	@YWhifY	H\Y`I bWcbgW]ci g`UbX`h\Y`GY`Z'!`: fYi X`
		H\i fgXUm'A UfVX '%%t\
		Cb`]bY`—'GYY`AccX`Y`Zcf`XYHJ]`g
	FYUX]b[	: fYi Xž'G"'f%-, -Ł''7]j]`]nUh]cb'UbX']hg'X]gWcbhYbhg'ž]b; Umž'D"'flYX"ŁZFZW8dNgVDW\$VWbZK"K "K"Bcfhcbz'BNZ
		dd"+&&! ++&
	Hi hcf]U`	5g gWXYXi `YX
	C b`]bY 5 Wf]j ]hm	GYY'A ccX'Y'Zcf'XYHJ]`g
K YY_') .'%) 'A UfWX'!'% A UfWX	@YWhi fY	@UVci f'UbX'h\Y'GY`Z'!'A Ufl'
		H\i fgXUmiA UfVX % h
		C b`]bY'-'GYY'A ccX`Y'Zcf'XYfU]`g
	F YUX]b[	A Ufl ž? 'f&\$\$\$Ł''9Wcbca ]WUbX'd\]`cgcd\]WU` a Ubi gWf]dhg'']b A W@Y``Ubž8"'fYX"Łž=Sd^? Sd, E WWUfW   d[f[`Yež&bX'YXb"žC ZcfX'  b]j Yfg]m
		DfYggžClZcfXž9lWfdlg'dd", '!-)
	Hi hcf]U`	5g'gWYXi `YX
/ \/\/ '* '00'\   \f\\\' '0*	C b`]bY 5 Wjj ]hm	GYY'A ccX'Y'Zcf'XYHJ]`g
K YY_'*.'&&'A UfVX'!'&* A UfVX	Cb`]bY`5Wh]j ]hm	: `YI]V]`]hmK YY_°'H\YfY'UfY'bc'gW\YXi `YX `YWhifYg'cf'hihcf]U'g'h\]g'kYY_"
		±b``]Yi 'cZ`YWn fY#n hcf]U`ž'd`YUgY'Wca d`YhY'h\]g cb`]bY'UWnjj ]hmfgYY'A ccX`Y'Zcf`XYhU]`gŁ"
	F YUX]b[	flcf'Cb`]bY'5Whjj]mt
		7 cYmYYž'>"A "'ff% Ł'H\Y'd\]`cgcd\Yfg`UbX'h\Y Ub]a U`g'`]b`FZWFS``Wd>WUfgdWea`: g_S` HS'gWež 8 Y`]j YfYX`UhDf]bWYhcb`I b]j Yfg]hmž'C WhcVYf'%) ž % - +ž'dd"%% !%('
		? UZ_Už': "'f% +%''5 fYdcfhhc'Ub'UWUXYa m'ž']b'8c6` I = SXJ S, FZW5a_ b'MfWE faqWež'GW\cW_Yb'6cc_gž BYk 'Mcf_ž'dd"&) \$!&) -
	Hi hcf]U`	Bc'hi hcf]U`'h\]g'k YY_
K YY_'+.'&- 'A UfWX'!'& 5df]`	@YWhifY	H\Y'5b]a U`'UbX'h\Y'GY`Z'!'8YgWUfhYgž'8Yff]XU'
		H\i fgXUm'%gh5df]`

	FYUX]b[	8 YgWUffYgžF "'f%,, Ł'8]gWcifgY'cb'h\Y'a Yh\cX'-dUfhJ'z]b'8 YgWUffYg. GY'YWYX'D\]cgcd\]WU K f]h]b[gžf7ch]b[\Ua z'>"'/ Ghcch\cZz'F "'fUbg"tz'5S_TqVYWG`[hWde[fk BdWeez'7 Ua Vf]X[Y'dd"(\$!(* 8 Yff]XUz'>"'f&\$\$(Ł'J]c'YbWY'U[U]bghUb]a U'g'']b'8ad L ZSfFa_adai, 3 6[S'aYgWz'GhUbZcfX'ib]j Yfg]hm DfYggz'GhUbZcfX''dd"*&!+*
	Hi hcf]U`	Bc'hhcf]U`XiY'hc'diV`]W\c`]XUmžcb`]bY'UWfj]hm'
	C b`]bY 5 Wf]j ]lm	5 Whjj ]hmi]b^^]Yi ^cZhi hcf]U^^! GYY^A ccX^Y Zcf`XYhU]`g
K YY_', .') '5df]`'!'- '5df]`	eyvin fy	A cfU`]lmUbX'h\Y'GY`Z'!'8Y'K UU`'
		H\i fgXUm, h\ 5df]`
		C b`]bY`-'GYY`A ccX`Y`Zcf`XYHJ]`g
	F YUX]b[	8 Y K UU`ž: "'f&\$\$' Ł'A cfU`]lm'UbX'h\Y'gcW]U` ]bgh]bWg. 7 cbh]bi ]lmk ]l\ h\Y'ch\Yf'df]a UhYg'žFZW FS``Wd>WUfgdWea`: g_S` HS'gWel XY`]j YfYX'Uh Df]bWYhcb'l b]j Yfg]lmžBcj Ya VYf'%!&\$ž'&\$\$' ž dd'''!'
	Hi hcf]U`	5g <sup>-</sup> gWkYXi <sup>*</sup> YX
	C b`]bY '5 Wf]j ]lm	GYY'A ccX`Y'Zcf'XYHJ]`g
K YY_``%&`5df]``!`%* 5df]`	@YWi fY	H]a Y'UbX'h\Y'GY`Z'!'6Yf[ gcb' H\i fgXUm'%) h\ '5df]` C b`]bY'-'GYY'A ccX`Y'Zcf'XYHJ]`g
	FYUX]b[	6Yf[gcbž'<"'f0%\$+0%,' \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
	Hi hcf]U`	5g <sup>-</sup> gWkYXi <sup>*</sup> YX
	5ggYgga Ybh	K cf_Vcc'mci f`Yblf]Yg`Zcf`k YY_g`&ž' ž'(ž') ž'+ž', ž'-ft'`]b`lcHJ`Ł'UfY`Xi Y`cb`Gi bXUm5df]`'% ž'VYZcfY %")-da "
K_YY_`%\$.`%_`5df]``!`&' 5df]`	@YWhi fY	8 YUh\ 'UbX 'h\ Y 'GY`Z'! '6 YW_Yf H\i fgXUm'&&bX '5 df]`
		C b`]bY'!'GYY'A ccX'Y'Zcf'XYHJ]`g
	F YUX]b[	6YW_Yfž'9"'f% +' Ł'FZW6W [S^aX6W\$fZž'gY`YW¶cbg
	FYUX]b[	6YW_Yfž'9"'f% +' Ł'FZW6W [S^aX6W\$fZž'gY`YW¶cbg

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### FYgci fWyg

#### DfYgWf]VYX F Ygci fWYg

 $Df]bhWcd]Yg`cZhY'k YY\_mUgg][bYX`fYUX]b[g`\Uj Y`VYYb`Wcad]YX`]bhc`Ub`f5FHG\&, +*`Ghi Xm?]hfik \]WX`]gUj U]`UV`Y`Zcf`di fWXUgY`Uhh\Y`I BGK `6cc_g\cd"``9`YWfcb]WWcd]Yg`cZh\Y`fYUX]b[g`UfY`U`gc`Uj U]`UV`Y`cb h\Y`5FHG&, +*`A ccX`Y`dU[Y.`\\hd.#\acx`Y\hY`h'ibgk \\YXi\\Ui\\\$ 

#### .

### FYWca a YbXYX FYgci fWfg

#### 7 ci fgY 9j U'i Uh]cb UbX 8 Yj Y'cda Ybh

Ghi XYbhiZYXVUW\_k]``VY`[Uh\YfYX'h\fci [\a m9| dYf]YbWY`gi fj YmgžUbX`mci `k]``VY`[]j Yb`cddcfhi b]hjYg h\fci [\ci hh\Y`gYa YghYf`hc`[]j Y`]bZcfa U``ZYYXVUW\_"`3DFE\$\*) (G` VW&fS` V[` Y fZWEWXk Ug``UghiHJi [\hi]b &\$% "`H\UhWc\cfncZghi XYbhg`[Uj Y`dcg]hjj Y`ZYYXVUW\_cb`h\Y`Wci fgY"

%".7 cbh/bh! 'h\Y'Wcbh/bh\Ug'VYYb'a cX]ZYX']b'cfXYf'hc'df]j ]Y[Y'XYdh\'fUh\Yf'h\Ub'VfYUXh\'[]j Yb'h\Y dfYggi fYg'cZh\Y'hf]a Ygh\f'gmgh\a /

&"'5bbci bW'a Ybhg'!'j ]XYc'gY[a Ybhg'a Um'VY'i d`cUXYX'hc'A ccX'Y']b'cfXYf'hc'UXXfYgg']ggi Yg'fY`UhYX'hc UggYgga Ybh'UbX'Wci fgY'Vi g]bYgg"'H\]g'k ]```[]j Y'i g'a cfY'h]a Y']b'`YWi fYg'hc'X]gW gg'Wci fgY'WcbhYbh'

 $H\Y'ZYXVUW_ik\Ug'j\Yfmai\W.'UddfYWJUhYXž'UbX'=`cc_'Zcfk\UfX'hc']a\ d`Ya\YbhJb['h\YgY'gi\[[Ygh]cbg']b\&\&\&S"'6Yghk\]q\Yg'Zcf'h\Y'Wca\]b['hYfa''$ 

# Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g Hi fb]h]b Gi Va ]gg]cb

⊋mci 'YbWci bhYf'U'dfcV`Ya 'k \Yb'UhhYa dh]b[ 'hc'gi Va ]h'mci f'Ugg][ ba Ybh'h\fci [ \'Hi fb]h]bž'd`YUgY

## 5 WUXYa ]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i=hWJbihU\_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW\_bck iYX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga ]bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

• i bXYfgHJbX'mci f'f][\hg'UbX'fYgdcbg]V]`]h]Yg'Ug'U'gh XYbh'Uhil BGK

# 5WUXYa]W±bZcfaUhjcb

: cf'YggYbhJU`ghi XYbh]bZcfa UhJcb'fY`UhJb['hc.

• fYei Yghg Zcf Yl hYbg]cb/